

AGRICULTURAL

Chemicals

IN
THIS
ISSUE:

This is TVA
Aromatic Solvents
Liquid Fertilizers
Farm Progress Show
Pesticide Technology
160 Fertilizer Situation
Reports on: WACA, Weed
Meeting and Cotton
Production Conference
APPUCATOR SECTION

APRIL, 1960





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gets knocked
around a
lot in my
business.”



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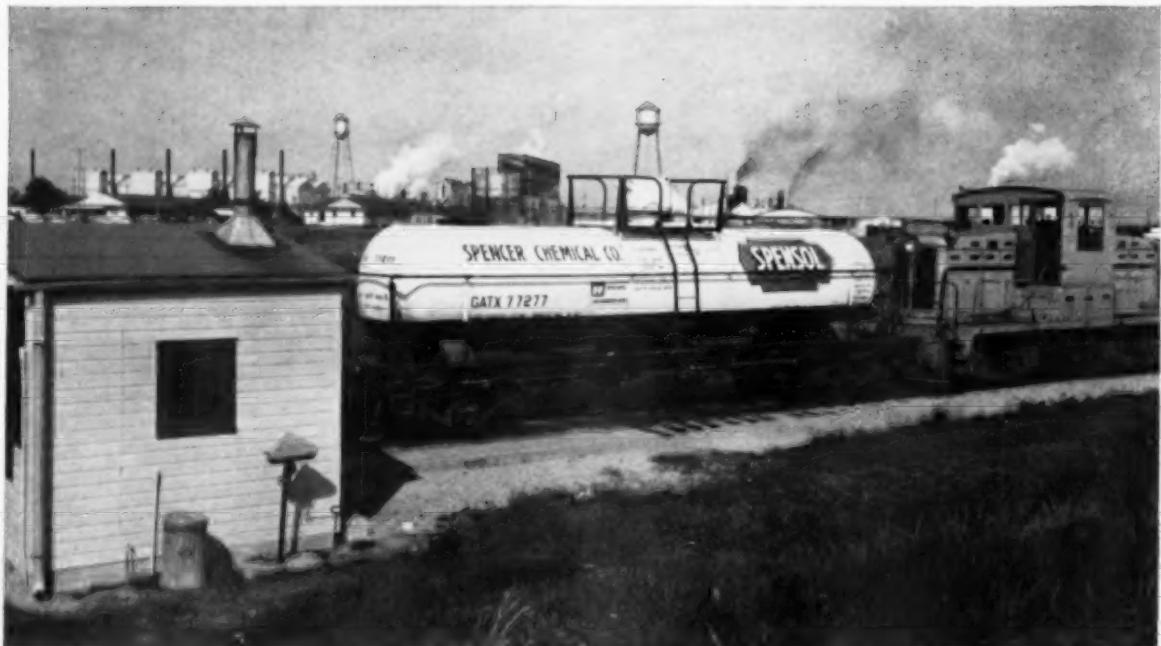


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Sample Number	Corrosion (Inches per Year)	Variation From SPENSOL GREEN
Brand A	.021	91%
Brand B	.024	118%
Brand C	.300	2,630%
Brand D	.022	100%
Brand E	.234	2,030%
Brand F	.017	54.5%
Old SPENSOL	.017	54.5%
SPENSOL GREEN	.011	—

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AGRICULTURAL CHEMICALS



This Month's Cover

Top photo: Allied Chemical & Dye Corporation's Nitrogen Division exhibit at the 1959 Farm Progress Show in Clarence, Ia. See story on page 40. Bottom photo: Phosphoric Acid plant at TVA, Wilson Dam, Ala. See p. 30.

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April, 1960

AGRICULTURAL

Chemicals

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*In the
Spotlight
this Month*

- **This is TVA . . .** About 150 fertilizer plants today use equipment or processes developed by Tennessee Valley Authority engineers and scientists. More than 30 per cent of the 2000 visitors each year to TVA's laboratories and plants come in for technical assistance. Some of the better known developments of TVA's fertilizer division are reviewed in this article. Page 30.
- **Aromatic Solvents . . .** Toxicity considerations of a solvent are most important in pesticide formulations, particularly if crops such as corn (which is particularly sensitive to solvents) are to be treated. Toxicity data is usually determined by the supplier and made available to the formulator. Page 34.
- **Liquid Fertilizers . . .** Economists indicate that the potential for liquid mixed fertilizers will depend to an increasing extent on the competitive position with bulk spreading of dry fertilizer. Manufacturers realize a limitation is the distance applicator must travel to reach customer . . . positive solution may be the cold-mix blending plant, serviced by full scale liquid fertilizer plant. Page 37.
- **Farm Progress Show . . .** Some 300,000 farm folks are expected to attend the 1960 Farm Progress Show to be held in September in Illinois. Crops treated with specific fertilizer applications are real evidence of results obtained in the field. Some 300 exhibitors of fertilizers, pesticides, farm equipment, etc., are expected to participate in the 1960 show. Page 40.
- **Pesticide Technology . . .** Operations most common to pesticide manufacture concern distillation for recovery of solvents or purification of product grinding, drying, mixing, and extraction. Equipment and unit operations are reviewed in this article based on a report presented before the chemical engineers annual meeting. Page 45.
- **Fertilizer Outlook . . .** Supplies of fertilizer raw materials for 1959-60 are expected to total 8,085,000 tons of plant nutrients. This tonnage is 5.2 per cent higher than the 7,685,000 tons which were available in 1958-59, and almost 20% above the 1957-58 figure. Page 48.

International Market Round-Up

The availability of Nitrogen for export is becoming more limited as some European producers are now reportedly sold out. The Japanese situation also is in better balance as far as supply and demand are concerned.

Attention currently is focused on Korea where

117,000 tons of Ammonium Sulphate
60,000 tons of Urea
10,000 tons of Ammonium Nitrate
12,000 tons of Ammonium Sulphate
Nitrate
21,000 tons of Ammonium Phosphate
20,000 tons of Single Superphosphate
21,000 tons of Triple Superphosphate

10,000 tons of Muriate of Potash were just purchased by the Government. Negotiations now are underway by private traders for the further purchase of 170,000 tons of Ammonium Sulphate, as well as substantial tonnage of Sulphate of Potash, Ammonium Phosphate and Superphosphate.

Greece Seeking Nitrogen

In the meantime, Greece is negotiating for 40,000 metric tons of contained Nitrogen and will purchase such carriers as Ammonium Sulphate, Ammonium Nitrate, Ammonium Sulphate Nitrate, Calcium Ammonium Nitrate, Calcium Nitrate, as well as 15,000 tons each of Triple Superphosphate and Ammonium Phosphate.

A tendency to strengthen also has been noticed in the world markets of both P_2O_5 and Potash. The fertilizer season in the States, at least up to this date, has been going extremely well and has almost withdrawn United States' Soluble P_2O_5 and Potash from the world markets. Some exports are still being made of Soluble P_2O_5 but they are limited in tonnage. Potash is being exported in a larger volume but here again, in the midst of the season there is a tendency for the material to develop some tightness. As a result, the world markets have been strengthened.

European Supply Down

Concentrated P_2O_5 such as Triple, is particularly short in Europe and the same situation is true of the more concentrated Ammonium Phosphates. Foreign Potash is not in the same short supply position but it is felt that some markets at least have been strengthened by the lack of American exports. The coming spring purchases in Japan will show the trend of the Potash market.

All indications would lead one to think that a firmer tone price wise must result from today's supply and demand situation. Some evidence of this has already been seen in Korea. As far as Nitrogen sales are concerned, the current tender in Greece, with a few exceptions, would indicate the same trend.

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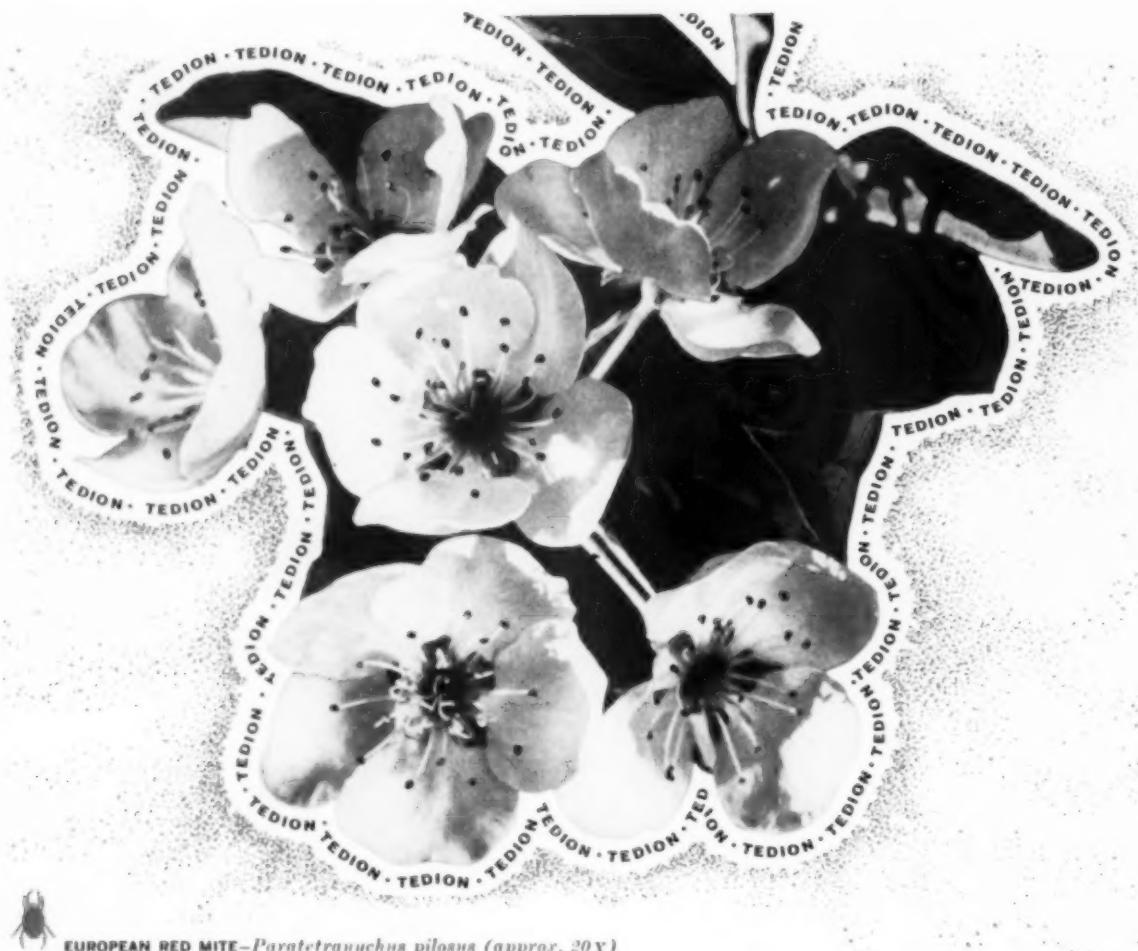
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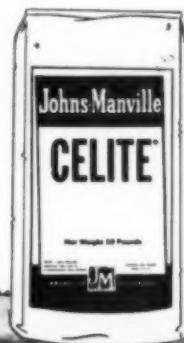
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April 4-7—National Packaging Exposition, Convention Hall, Atlantic City, N. J.

April 5-9—American Chemical Society, general assembly in Cleveland, Ohio.

April 5-14—American Chemical Society, 137th National Meeting, Cleveland, Ohio.

Apr. 6-7—LSU Forestry Symposium, Louisiana State Univ., Baton Rouge.

April 11-12—California Fertilizer Conf., Fresno State College, Fresno, Calif.

June 12-15—National Plant Food Institute, annual meeting, Greenbrier Hotel, White Sulphur Springs, W. Va.

June 21-22—Southern Feed & Fertilizer Control Officials, Riverside Hotel, Gatlinburg, Tenn.

June 27-29—Pacific Branch, Entomological Society of America, Davenport Hotel, Spokane, Wash.

July 13-15—Fertilizer Conf. of the Pacific Northwest, Hotel Utah, Salt Lake City.

July 27-30—Southwest Fertilizer Conf. and Grade Hearing, Galvez Hotel, Galveston, Tex.

Sept. 11-14—Canadian Agricultural Chemicals Association, Britannia Lodge, Muskoka, Ontario, Canada.

Sept. 11-16—American Chemical Society, 138th National Meeting, New York, N. Y.

Sept. 12-14—Entomology Society of Canada, 10th Annual Meeting with Entomology Society of Saskatchewan, Saskatoon, Saskatchewan.

Sept. 24-26—Western Agricultural Chemicals Association, 31st Annual Meeting, Palm Springs Riviera Hotel, Palm Springs, Calif.

Sept. 27-29—National Agricultural Chemicals Association, Annual Meeting, Del Coronado Hotel, Coronado, Calif.

Sept. 29-30—Northeast Fertilizer Conf., Hotel Hershey, Hershey, Pa.

Oct. 5-6—Southeast Fertilizer Conf., Atlanta Biltmore Hotel, Atlanta, Ga.

Oct. 17-18—Fertilizer Section, National Safety Congress, Chicago.

Nov. 3-4—Fertilizer Industry Round Table, Mayflower Hotel, Washington, D. C.

Nov. 13-15—California Fertilizer Assn., del Coronado Hotel, Coronado, Calif.

Dec. 5-7—Carolinians-Virginia Pesticide Formulators Assn. annual meeting, Carolina Hotel, Pinehurst, N. C.



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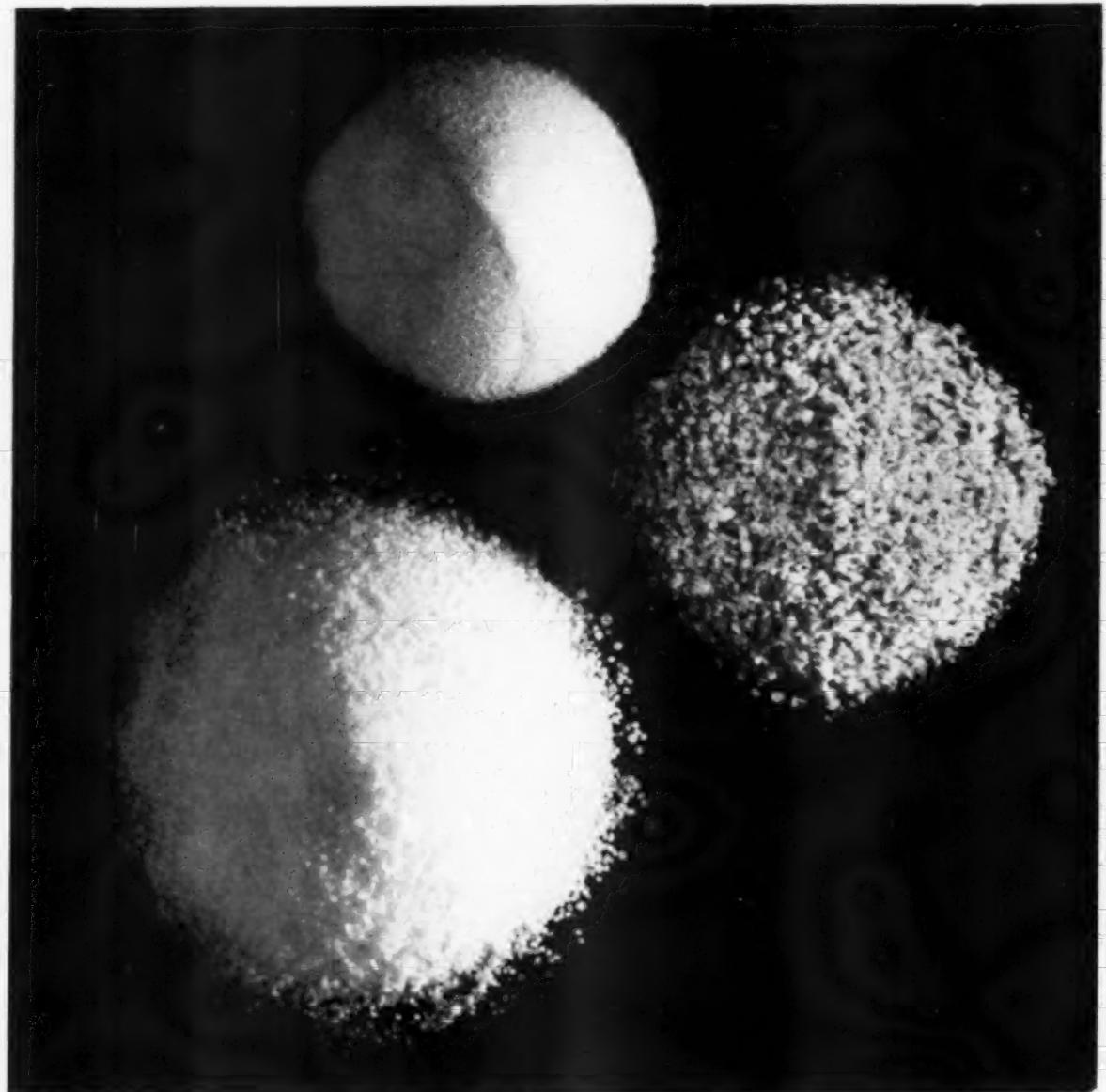
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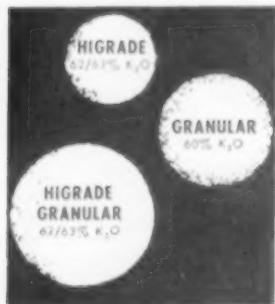
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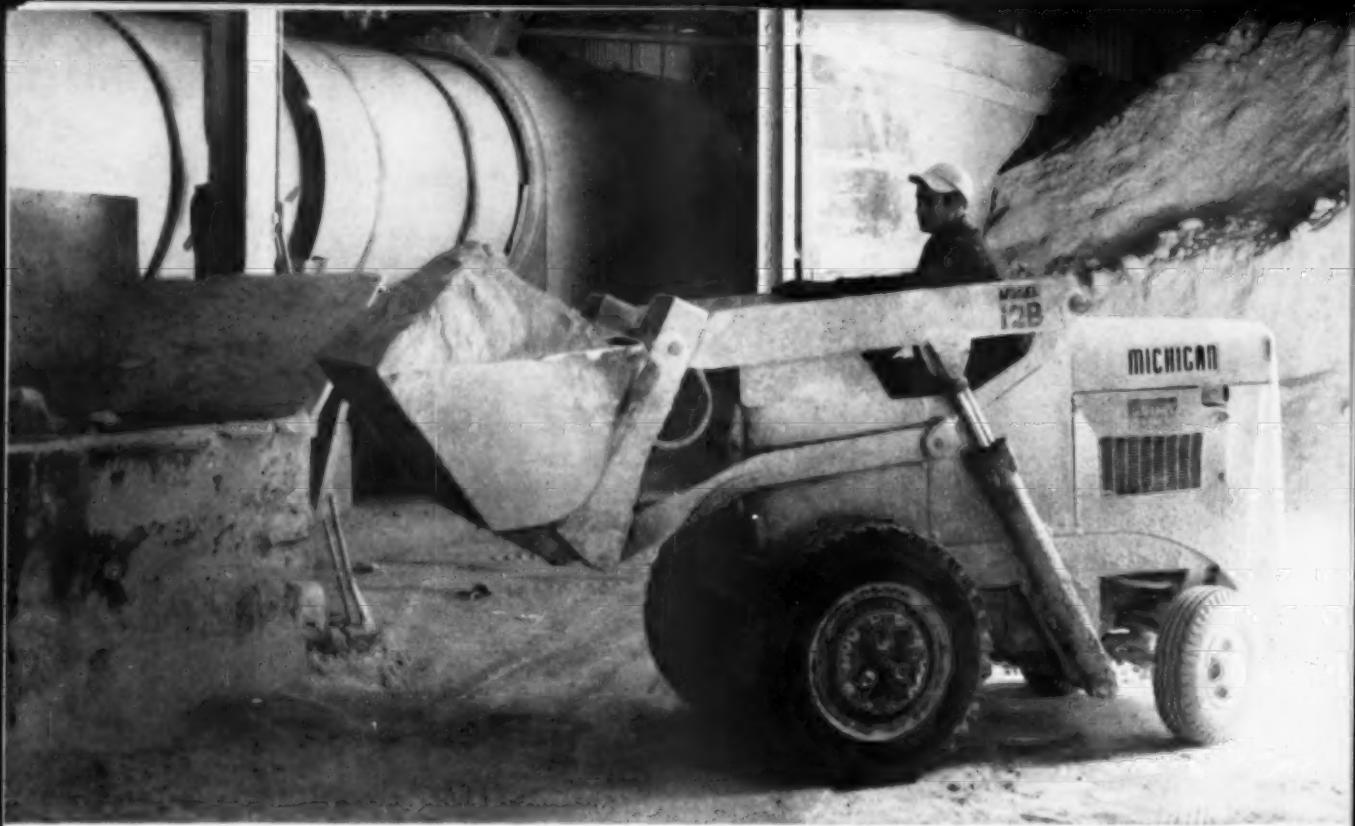
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Virginia-Carolina: "Michigans a big factor in reducing costs"

Time and time again it's performance that counts . . . and that's why the list of fertilizer manufacturers who own Michigan Tractor Shovels is long and impressive.

Virginia-Carolina Chemical Corporation is a good example.

One of their typical plants—at East St. Louis, Illinois—owns three Michigans. Their most recent report says the following . . . "Our Michigans (it reads) have turned in *major* cost-reducing, production-boosting performances!"

The story starts in 1956. That year, of the nine sizes of Michigans available, Virginia-Carolina chose the 16 cu ft Model 12B. Two of them were bought from Michigan distributor Bardale Equipment Co, St. Louis . . . the Michigan no-foot-clutch, power-shift transmission and fully-sealed all-Clark power train considered major benefits over existing equipment. The success of these machines led, as production demands increased, to purchase, in 1958, of the third Michigan Tractor Shovel.

When the above picture was taken,

the three Michigans had compiled a total of 23,100 working hours. Outside of a minor steering column failure, they had lost virtually no assigned work time.

Their assignment included (and still includes) handling of all kinds of material—superphosphate, muriate of potash, ammonium sulphate, and others. On a typical job—taking material from boxcars to conveyor hopper—one machine usually will make

etc. Loads range from 880 to 2,000 pounds each.

Lifting capacity, incidentally, of these 12B Michigans is 3,000 pounds. A wide range of buckets are available, 9 to 27 cubic feet. For still greater capacity, there's a new machine—also with two-wheel-drive—the 1 yd (standard bucket) Model 55B. Also available are seven job-proved four-wheel-drive Michigans, ranging from the 1 yd Model 55A to the Model 375A which handles buckets up to 10 cu yd capacity. Your Michigan Distributor will be glad to demonstrate any of them. Ask him anytime—see for yourself why firms like Virginia-Carolina, Agrico, Armour, Swift, International Minerals, Olin Mathieson, Smith-Douglass all buy—and repeat buy—Michigan fleets.



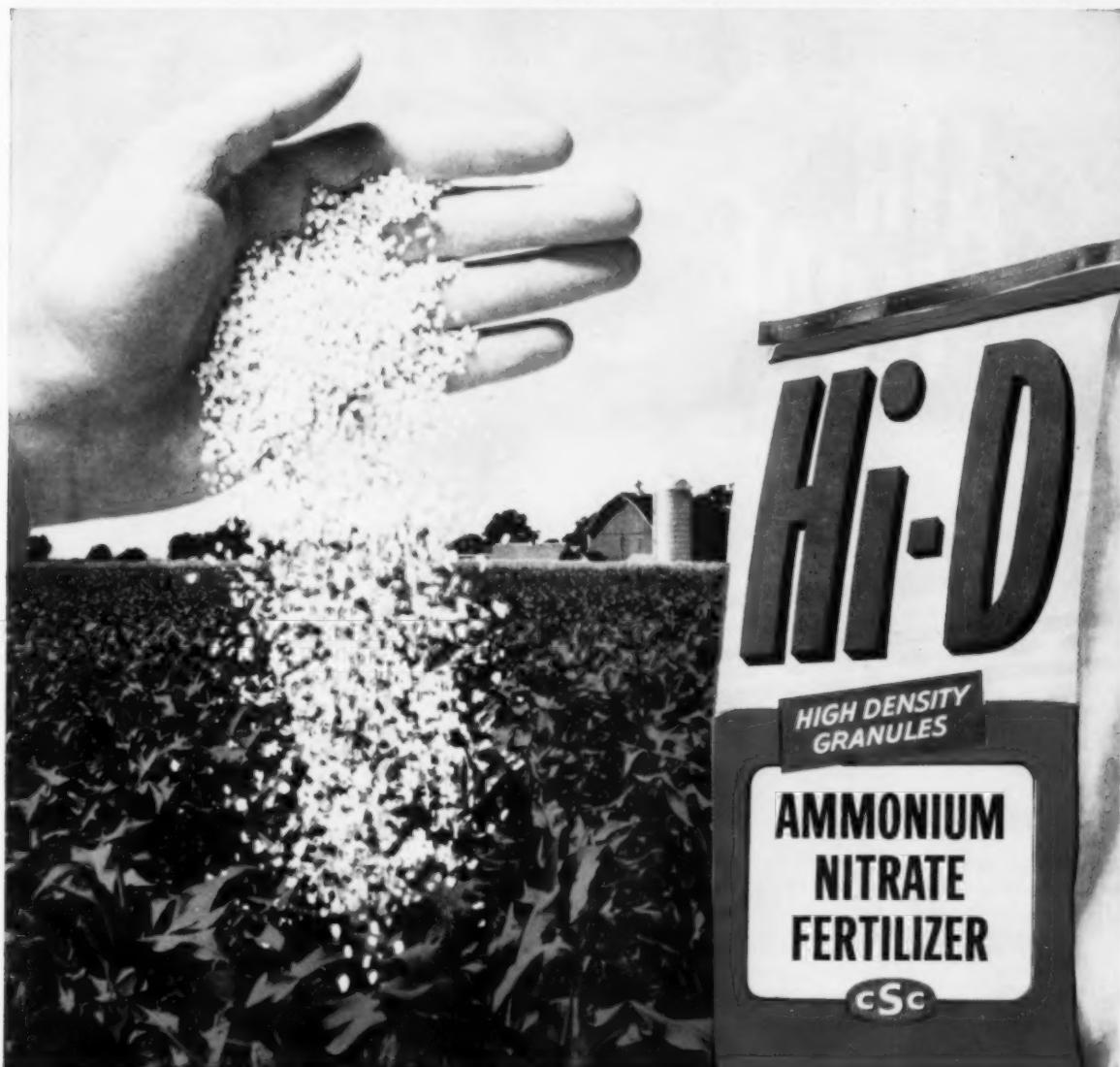
about 40 shuttle trips an hour. The complete unloading task takes about two hours. Units also handle binned material, feed the batch scale, etc,

Michigan is a registered trademark of
CLARK EQUIPMENT COMPANY
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↓ During the fertilizer season, advertisements like this in full color are appearing in *Farm Journal*, *Farm & Ranch*, *Progressive Farmer*, and *Successful Farming*.



Keeps crops on the grow *it's the ammonium nitrate that's granular!*

Corn, cotton, wheat, pastureland — whatever your crop, Hi-D® is the nitrogen fertilizer to use. You'll find it better than any ammonium nitrate you ever used before.

Hi-D always flows freely! Hi-D's special granules are unusually high in density and super dry, have much less tendency to pick up moisture prior to application. You will find it most satisfactory out in the field, even under humid conditions. Hi-D doesn't gum-up, won't clog, cake or bridge in your spreader.

Hi-D has a guaranteed analysis of 33.5% nitrogen. Half of this is nitrate nitrogen for vigorous early growth. The other half is ammonia nitrogen for sustained follow-up feeding. Your crops get the two types of nitrogen they do best on!

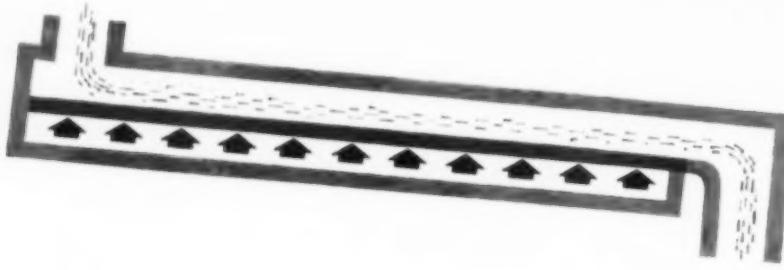
Let Hi-D keep your crops on the grow. It's sound management. But remember, first test your soil, lime if necessary and follow with the mixed fertilizer your dealer recommends. Then add the supplementary boost of Hi-D. Ask your dealer for it by name. Hi-D—best in the land!

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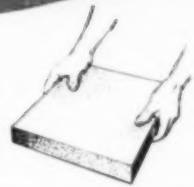
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AIR FLOT

the better-built, more efficient
air-gravity conveyor
provides the answers to
Dry Solids Conveying



The special porous plate
is exclusive with
KENNEDY AIR-FLOAT.
It is strong, resistant to
abrasion and temperature
and has a smooth surface
texture.



Sections are ruggedly
designed, formed on
modern production
equipment and com-
pletely assembled before
shipment.



Q. How does AIR-FLOAT work?

A. The dry material to be conveyed is fed on to a smooth, rigid, porous plate through which low pressure air continuously diffuses. Because the conveyor is inclined about 6 to 8°, the aerated material flows by gravity.

Q. What distinguishes the KENNEDY AIR-FLOAT from other air-gravity conveyors?

A. Primarily, the special porous plate. Also the casing is of heavier construction, flanged and channeled for greater rigidity.

Q. How is this special plate better than other porous media?

A. The AIR-FLOAT porous plate has literally millions of tiny pores through which the air diffuses uniformly for thorough aeration of the conveyed material. The plate is thicker, stronger, temperature- and wear-resistant, and has a very smooth surface texture.

Q. How does this improve conveying?

A. AIR-FLOAT has a much higher capacity than competitive air-gravity conveyors. Blind spots are eliminated and the angle of inclination is less critical.

Q. What about maintenance?

A. The KENNEDY AIR-FLOAT is the nearest thing to a completely maintenance-free conveyor that has ever been devised.

Q. Can turns be made?

A. Direction changes up to 45° are made with standard pieces. These can be combined for greater angles.

Q. Are accessories available?

A. Yes. End and side discharge boxes, splitters, control gates, transitions, bin extractors and required blowers can be provided.

Q. Have KENNEDY AIR-FLOAT Conveyors been fully tested and proven?

A. Yes. For more than 12 years AIR-FLOAT Conveyors have been successfully used in KENNEDY-designed cement and lime plants. With this background of experience, KENNEDY is now making AIR-FLOAT available to industry, mass producing it to sell at competitive prices.

For more information on AIR-FLOAT, ask for Bulletin 58-K.



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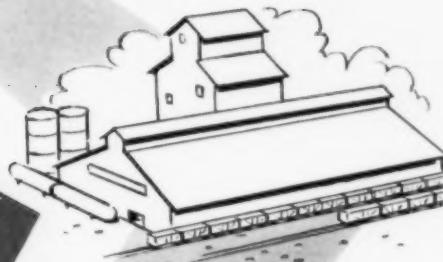
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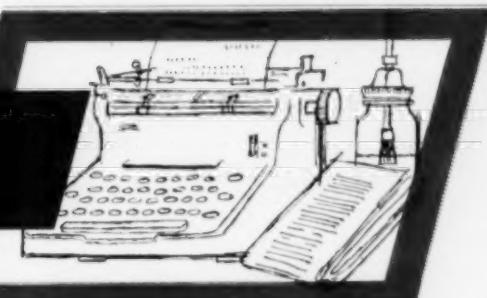
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EDITORIALS



THIS is the time of year in the agricultural chemicals business when the warehouses are bulging with inventories of finished stock, plants are still operating at full capacity, management is racking its brains to find the space to store the new production, and yet is looking ahead with trepidation toward the period immediately ahead when the shipping instructions will start to roll in. Will it be the anticipated "big" year, and will they be hard pressed to keep deliveries rolling to eager buyers,—or will it prove to be one of those dismal years when at the end of the season heavy stocks still remain to go into inventory, with losses instead of profits all that's left to show for six or eight months of frenzied activity and strain?

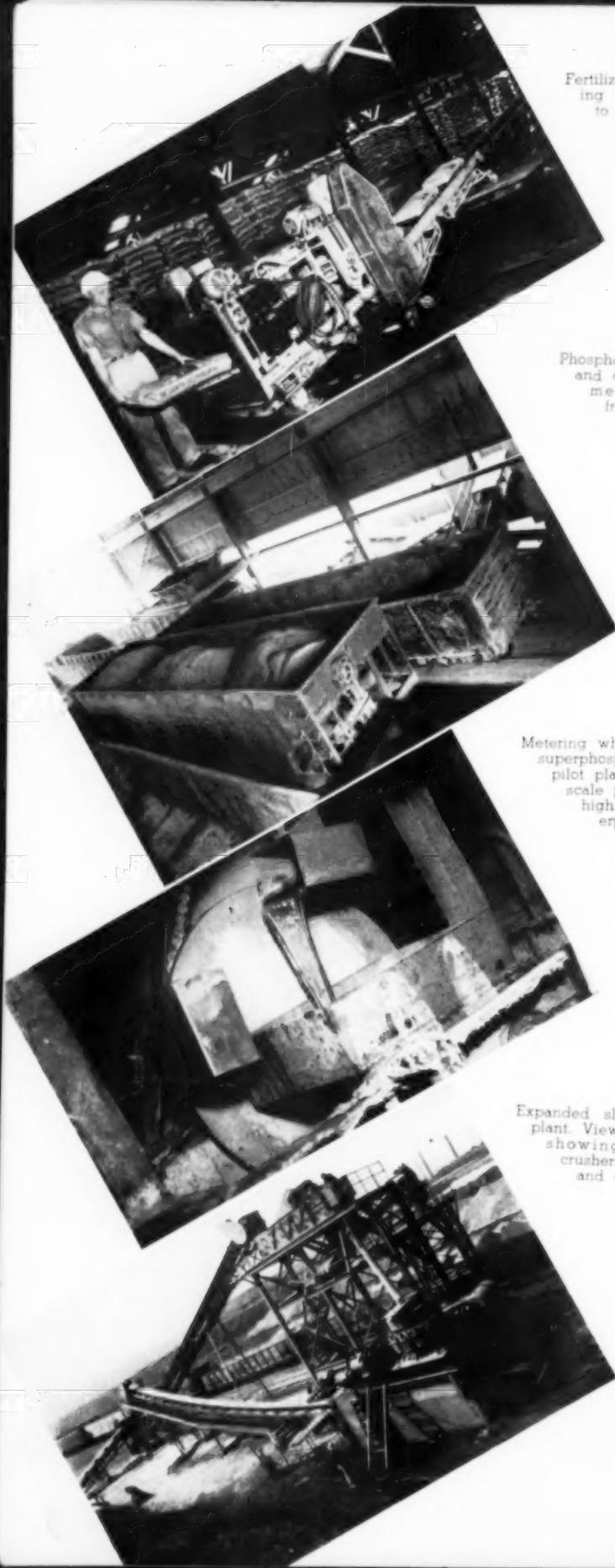
Our own feeling,—and one that is reinforced by all that we hear in the way of reports from the field—is that 1960 should be the biggest year yet, for the sale of both fertilizers and pesticide. As for fertilizers, it was quite apparent from the figures for the 58-59 crop year that a new wave of increased plant food use is sweeping over the American farm. All of the educational work, and the sales promotion programs, including N.P.F.I.'s major efforts, have apparently taken full hold. It would indeed be unusual if 1960 did not see a continuance of the upward trend, with another major consumption gain to match the increases of the last two crop years.

Turning to the outlook for pesticides, the picture here is not nearly as clear. The cranberry scare of last winter, and the recent restrictions on pesticides such as heptachlor, may very possibly be indicative of what lies ahead. Many growers, we suspect, are going to be much more cautious this season about what pesticides

they apply to an edible crop, conscious that Food and Drug may well be waiting to make another whipping boy out of the next group to misuse a useful product. In an industry that already faces enough uncertainties—of weather, crop controls, insect infestations, changing labeling requirements, etc.,—still another variable has been added. Formulators of pesticides, dealers and applicators must now be prepared, perhaps on very little notice, to switch their products and their plans in line with changing governmental regulations.

Fortunately for the industry, the pesticide market is steadily growing. Over the past few seasons a lot of farmers have learned that effective soil pesticide treatments and efficient herbicide applications can do a dramatic job of increasing yields. They are going to insist on using more pesticides this year, and their example is going to lead their neighbors in the same direction. If the pesticide industry, the county agents and the experiment stations can get the message across to the farmer that it is imperative to use the powerful chemical tools, *only as directed*, there is every reason to believe that the market for pesticides can be made to grow dramatically over the next few years.

THE Wisconsin committee, appointed by Governor Nelson to "develop a consistent policy on the use of agricultural chemicals," appears to be comprised of some of the top men in the field and should have a valuable contribution to make. The thought has occurred to us, however, that, if other states follow suit—a not unlikely development—and appoint committees to develop their own consistent policies, the overall national policy might be anything but consistent.



Fertilizer bag-flexing machine used to break bag seal.

Aerial view of TVA Fertilizer and munitions center

Phosphate blending and drying equipment viewed from overhead crane.

Metering wheel used for superphosphoric acid in pilot plant and plant scale production of high analysis superphosphate.

Expanded slag crushing plant. View from trestle showing screen, crushers, conveyors, and cars of slag.

This is

"**T**o operate experimental chemical plants for the development of new fertilizer materials,"—is one of the basic objectives of the Tennessee Valley Authority, which recently observed its 25th anniversary. A corporate agency of the federal government, the functions of TVA cover such broad areas as: Power, Recreation, Agriculture and Forestry, Navigation and Flood Control. Fully stated, objectives of the Congressional Act of 1933 in creating TVA were:

"To regulate the flow of the Tennessee River system to create a deep water navigation channel in the Tennessee River and to regulate flood waters in the Tennessee and lower Mississippi Valley; to produce power; to provide for reforestation and for the agricultural and industrial development of the Valley; to provide for the national defense; to operate experimental chemical plants for the development of new fertilizer materials, and for munitions in times of emergency."

To members of the agricultural chemicals industry, TVA is best known for its program in fertilizer development. But even the scope of this phase of TVA research and investigation is not fully recognized or realized. A great need in the agricultural chemicals industry (and perhaps in most industries) is that for basic research. Funds for investigations and studies which have no immediate commercial potential are hard to come by. Thus some of the projects at TVA, which are beyond the immediate interest or capacity of



The Tennessee Valley Authority

industry, never go beyond the report stage . . . nonetheless they provide the groundwork for some of the most valuable developments.

New problems in agriculture arise constantly, as new knowledge in soil chemistry is uncovered,—as the availability of raw materials, production costs, and farmer preferences change, and as resources dwindle. Research is designed to seek out on a continuing basis some of the solutions to problems brought about by these changing conditions. It is directed toward the development of alternative processes of making suitable fertilizers for different soils and different climates. It seeks to make the most efficient use of natural resources and other raw materials available in the various parts of the country.

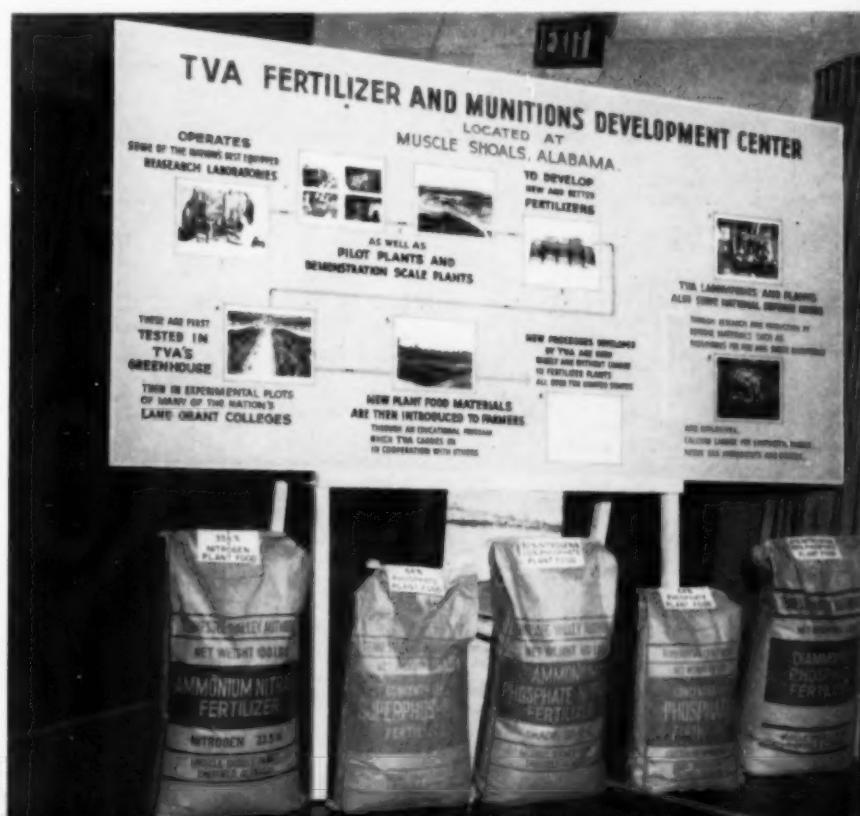
The TVA fertilizer program combines chemical research on new fertilizers and manufacturing processes with education among farmers in the use of fertilizers. The laboratories and plants at Muscle Shoals have produced new types of fertilizer and processes which lower the cost to the farmer. The educational programs are geared to the needs of the farmers through active cooperation of state agricultural colleges. TVA sponsors demonstrations* for industry as well as for

farmers. In the demonstrations and workshops with industry, TVA offers information on fertilizer production process and equipment. Its patents are made available to private industry on a royalty free basis, and materials are offered for use in making experimental fertilizers with the proviso that the data from the process be made available for the benefit of the industry.

Since 1933, TVA has carried on research and development work

on many new fertilizer materials. In the course of its work, it has been granted 119 patents; of these 96 were on fertilizer and munitions developments, 13 on mineral developments, and 10 on miscellaneous inventions. As of January, 1960, the TVA has granted some 210 licenses to 161 different companies. These included licenses to firms manufacturing equipment of TVA design as well as companies using equipment or processes. A

Display at municipal building, Sheffield, Alabama



*The 1959 demonstration featured a relatively new line of investigation, — the use of wet process phosphoric acid in making liquid fertilizers. See story in *AGRICULTURAL CHEMICALS*, pp 24-26 July, 1959, and pp 32-34, August, 1959.



- TVA liquid fertilizer unit—base solution flowing from reactor; pH meter electrode located in box above spout



- Interior of ammonium nitrate fertilizer granulator



- TVA electric phosphorus furnace.

total of about 220 fertilizer plants are now using such processes or equipment.

Muscle Shoals, Alabama, offers technical cooperation and information. Outstanding chemists are retained by TVA as consultants on current problems in fertilizer research. When technical reviews of the projects underway seem desirable, TVA holds conferences with experts. And, as projects of interest to industry approach some state of conclusion, conferences are held to which industry is invited so that the results obtained can be reported and illustrated.

TVA yearly welcomes more than 2000 visitors to the labora-

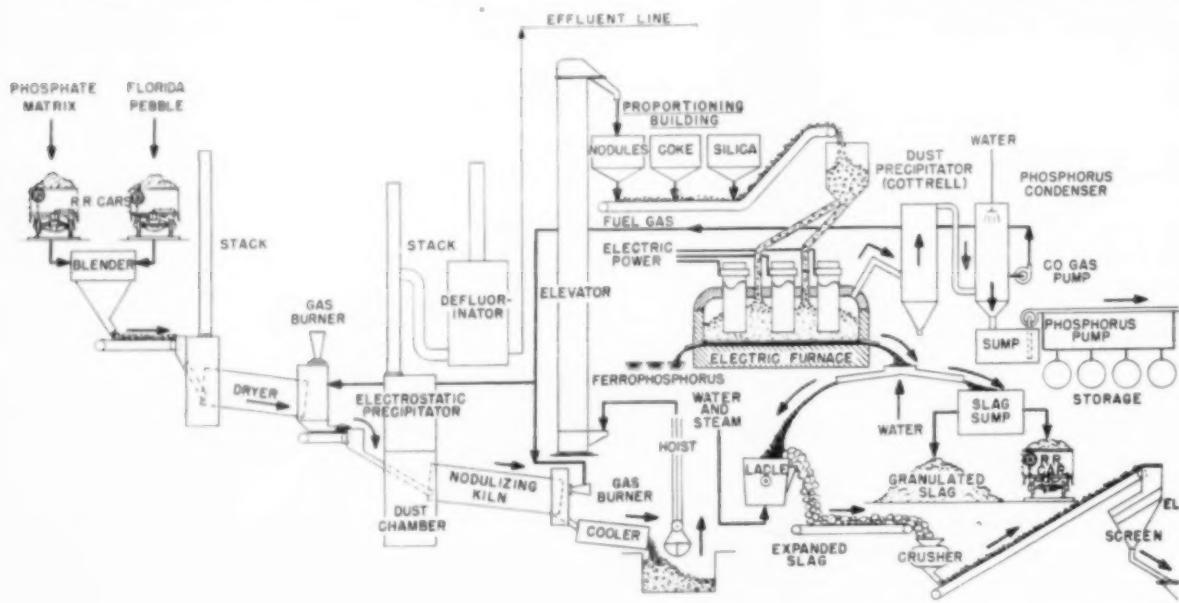
atories and plants at Muscle Shoals—and of this number, about 30 to 50 per cent come for technical assistance. Information is disseminated in other ways—through publication of chemical engineering reports and bulletins, through articles in technical journals, and through voluminous correspondence in response to requests for technical data.

Some of the better known developments of TVA are reviewed below, — and illustrated on these and the following pages are photographs of TVA equipment and processes.

Ammoniator-Granulator. A continuous ammoniator granulator — probably the best known of TVA developments — has become the most widely used of the TVA developments. As the national trend toward high analysis fertilizers has become more pronounced, and as fertilizers in granular form have become increasingly popular, TVA's research on such products and processes has been intensified.

The ammoniator granulator is useful in both small and large commercial fertilizer mixing operations. Since its introduction in 1953 at pilot plant demonstrations, it has been installed in well over 140 plants across the United States. Its

Flow diagram of TVA superphosphate plant.



effectiveness in combining calcium metaphosphate and diammonium phosphate in high analysis fertilizer mixtures has stimulated interest in these two materials.

Calcium Meta-Phosphate. In the course of experiments to develop concentrated phosphate fertilizers, TVA laboratories evolved (in the late 30's) a brand new material—calcium metaphosphate, and a pilot plant for making it. The new fertilizer was of a high concentration,—60 per cent P_2O_5 and more recently has been improved to 63-64 per cent P_2O_5 . Farmer education has brought a heavy demand for the product, TVA reports. Industry, however, has not adopted the process, although one company is reported to be considering it for use when it builds a second electric furnace in the west.

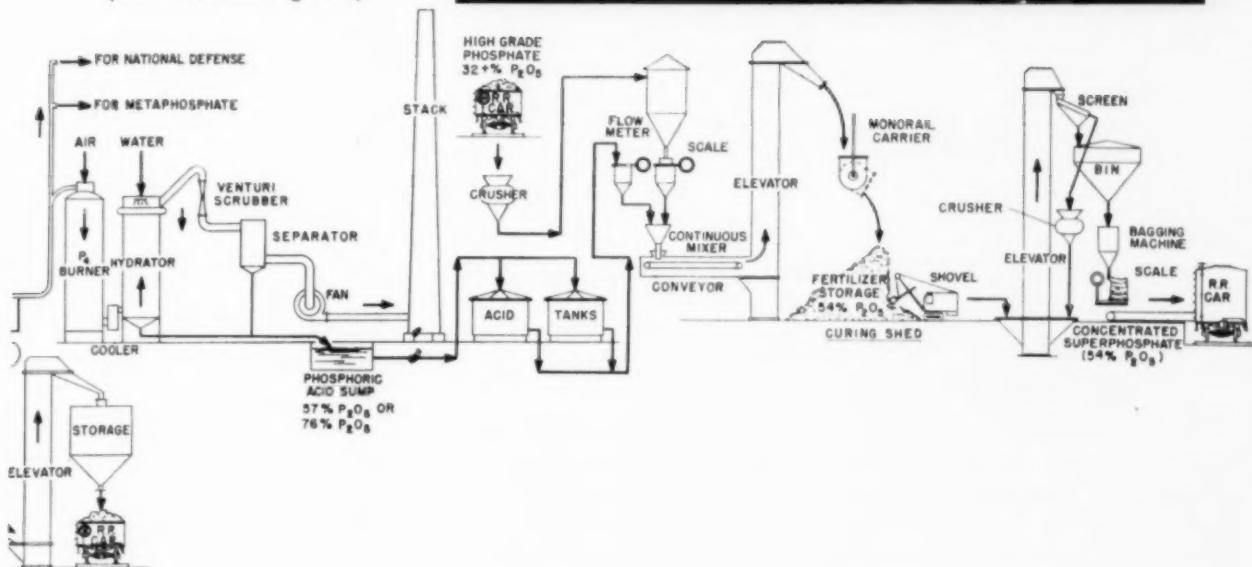
Phosphoric Acid. A recent development of potential industrial importance is production of superphosphoric acid, which is about 40 per cent more concentrated than regular furnace acid. The super acid is less corrosive than regular acid, remains liquid in cold weather, and contains less water. The latter property makes easier the production of dry, well granulated fertilizer mixtures. Super acid can be used also in the production of more concentrated liquid fertilizers than can be made with regular

(Continued on Page 115)



Pictured Above: Pan filter,—top view showing suction and blower systems and feed boxes. Leached zone fertilizer plant.

Below: Interior view of TVA ammonia plant.



Aromatic Solvents for Pesticides

Phytotoxicity characteristics are a major consideration

Formulators select solvents on the basis of several factors, for example: ability to dissolve the toxicant; compatibility; boiling range; flash point; toxicity; odor and color; cost and availability. The formulator can and does evaluate most of the important solvent characteristics, except phytotoxicity.

Toxicity testing is usually the responsibility of the solvent supplier.

This article reviews some of the applications of xylene type solvents in pesticide formulations for corn, — one of the crops which is normally particularly sensitive to solvents.

DURING the past few years the pesticide formulator has been given an ever increasing list of raw materials from which to choose, especially in the field of emulsifiable concentrates. Many new toxicants and emulsifiers have been developed. In fact, most emulsifiers used today did not exist five years ago.

In the case of solvents, the most notable change has been the increased number of suppliers offering aromatic solvents to the pesticide formulator. Solvent suppliers competing for the formulator's business have improved their products and increased their services. For example, as a result of keener competition, solvent suppliers now generally offer one or two-day delivery from a network of strategically located storage facilities. This represents a definite advantage to formulators, who usually have limited storage tanks for aromatic solvents. In the past, they often found it difficult to obtain enough solvent during the formulating season.

In recent years, large quantities of aromatic hydrocarbons (both monocyclic and dicyclic structures) have become available at low cost. This greater availability has resulted from the development by the petroleum industry of

catalytic reforming processes that convert naphthenes to aromatics. The aromatic naphthas have especially good solvency and are sufficiently low in cost to encourage their use in concentrates involving DDT, dieldrin, lindane, BHC, endrin, aldrin, etc., as well as for insecticide-fertilizer combinations. Of course some toxicants, such as toxaphene and chlordane, are readily soluble in aliphatic hydrocarbons such as kerosene.

The agricultural chemical industry consumes about 25-30 million gallons of aromatic solvents annually. These materials are generally classified in four groups: (1) heavy aromatic naphthas, (2) xylene, (3) xylene-type, (4) specialties. Table I lists some of the solvents currently available to the pesticide formulator.

The pesticide formulator selects a solvent on the basis of several factors. Specific end uses for the finished formulation may place special emphasis on certain solvent characteristics but, in general, the following eight factors are considered important.

1. Ability to Dissolve the Toxicant. The solvent must not only dissolve enough pesticide for effective use, but it must also keep the toxicant in solution, even

when the concentrate is stored in unheated warehouses from season to season. Similarly, if any precipitation does occur at low temperatures, the solvent should be able to redissolve the toxicant upon return to normal temperatures.

2. Compatibility. The solvent must not adversely affect the chemistry of the toxicant, or the action of the emulsifier. In general, modern emulsifiers are highly effective, and the formulator can substitute competitive solvents of similar boiling range without changing his established formulas. However, where solvents of widely different boiling ranges are interchanged, i.e. xylene-type to heavy aromatic naphtha, a change in the emulsifier system may be required. In some cases, the chemical composition of solvents within a particular boiling range can vary, and some solvents may need more or less emulsifiers, thereby affecting the cost of the finished insecticide.

3. Boiling Range. The boiling range indicates the rate of evaporation and flash point. The rate of evaporation can be critical in many insecticide formulations. The type of insects in

Table I. Some typical solvents available to the pesticide formulator.

XYLENE-TYPE SOLVENTS	SUPPLIERS	HEAVY AROMATICS	SUPPLIERS
Panasol RX-4	Amoco Chemicals Corp.	Panasol An-2K, AN-4,	Amoco Chemicals Corp.
Bronoco Hi-Sol 2206,	R. J. Brown Co.	AN-1, AN-2	
30-D			
Drake Special Solvent	Drake Petroleum Co.	Drake Special Solvent	Drake Petroleum Co.
D-34		D-74	
Amsco-Solv B-90	American Mineral Spirits Co.	Bronoco Hi-Sol 4-2K,	R. J. Brown Co.
Espesol 5	Eastern States Petroleum & Chem. Co.	4-2, 2309	
Humble Solvent 85	Humble Oil Co.	Espesol 3	Eastern States Petroleum & Chem. Co.
Solvent V-55	Vickers Petroleum Corp.	HAN	Humble, Esso, Penola, Std. Oil (Ky.)
Cosdenol X-85	Cosden Petroleum Corp.	Velsicol AR-55	Velsicol Chemical Corp.
Skelly SK-10	Skelly Oil Co.	Solvent V-120	Vickers Petroleum Co., Inc.
Socal Solvent #2	Standard Oil Co. (Calif.)	Amsco-Solv H-SB	American Mineral Spirits Co.
Shell Cyclo-Sol 35	Shell Oil Co.	Shell E407-R Solvent	Shell Oil Co.
ALIPHATICS			
Kerosene	All major petroleum refiners and resellers.		
Mineral Spirits			
Diesel Oil			
Fuel Oil			
Stoddard Solvents			
Deodorized Kerosenes			

volved, the method of application, and the crops to be treated, are all factors which the formulator must consider in his selection of the solvent and its boiling range.

4. **Flash Point.** High flash points may help reduce the formulator's fire insurance rates and improve the safety of his plant. Similarly, the dealers who keep inventories of the finished insecticides in stores and warehouses are aided by lower insurance rates and fewer storage problems if high flash point solvents are used. Flash points above 80°F. are desirable in order to avoid the I.C.C. red label and other inconveniences. Flash points are important in regard to the fire hazards involved, which are largely determined by the method of application, e.g. airplanes, fogging machines, aerosols, etc. Because emulsions are prepared with such large quantities of water, the flash point of the solvent does not present any fire hazard in application.

5. **Specific Gravity.** Where insecticides are sold on a weight-per-volume basis, specific gravity is of little importance. For emulsifiable concentrates labeled and sold on a percentage basis, low specific gravities are desirable. The stability of the finished emulsion is greatest if its specific gravity is just slightly lower than that of the water used.
6. **Toxicity.** The solvent must not be harmful when the formulation is used as recommended. While it is recognized that all aromatic naphthas are toxic to plants to some degree, the damage caused will be more a function of the rate of application and the sensitivity of the plant.

Using a solvent with the least known-phytotoxicity for intended crops, and applying the insecticide in accordance with the formulator's instructions are the best methods of minimizing crop damage. Although xylene is considered the least troublesome, even it can cause burning if evaporation rates are not suitable, or if the formulation is applied improperly. With proper dilution and application rates, many agricultural insecticides can be used safely, even though they contain solvents that are relatively toxic to crops.

7. **Odor and Color.** In household pesticides, strong or unpleasant odors should be avoided. For agricultural use, odor is less im-

by Lloyd W. Norkus

Lloyd W. Norkus is in the Marketing Department of Amoco Chemicals Corporation. Before joining Amoco, Mr. Norkus was a special sales engineer in the Standard Oil Company (Indiana). He received a Bachelor of Science degree in Chemical Engineering from Illinois Institute of Technology in 1941.



Table II.
Phytotoxicity of Insecticide-Solvent Concentrates on Cotton in Texas
Comparison of PANASOL AN-2K with a Competitive Heavy Aromatic Naphtha

Qts./Acre	Solvent	Leaf Stage	7/12 Matured 6 Wks.					
			1 Wk.	2 Wks.	2/21	2/28	4 Wks. Unopened	Bolls
1	Panasol AN-2K	0	0	0	0-1	0	0	0
1	Hvy. Arom. Naph.	0	0	0	0-1	0	0	0
2	Panasol AN-2K	0	0	0	0-1	0-1	0-1	0
2	Hvy. Arom. Naph.	0	0	0	0-1	0-1	0-1	0
3	Panasol AN-2K	0-1	0-1	0-1	1	0-1	0-1	0
3	Hvy. Arom. Naph.	0-1	0-1	0-1	0	0-1	0-1	0
4	Panasol AN-2K	1	1	1	1	0-1	0-1	0
4	Hvy. Arom. Naph.	1	1	1	1	0-1	0-1	0

TEST METHOD: Two pounds DDT were dissolved in each gallon of solvent, emulsified, and diluted with four gallons of water before spraying. The cotton was treated when it was in the young seedling stage, squaring, and the young boll stage. Phytotoxicity ratings were based upon the following criteria.

0—None.

- 1—Slight, pin point spots indicating chlorosis but less than 1% of total leaf area affected.
- 2—Moderate, leaf spots up to 2 mm. in diameter, but not over 5% of total leaf area affected.
- 3—Severe, profuse spotting, desiccation and inhibition of growth.
- 4—Killing and desiccation of shoots of plants.

portant. Solvents of petroleum origin are generally produced on catalytic reforming units; therefore, they are low in sulfur and without disagreeable odors. The color of the solvents does not affect the formulation, but sometimes it may have a psychological effect.

8. Cost and Availability. Adequate quantities of petroleum solvents are available to the insecticide formulator. Even dur-

ing periods of peak demand, supply should not be a problem. Faced with keen competition, the formulator naturally wants a low cost solvent. He also finds, however, that his product performs best when he uses a solvent that will afford good insecticide solubility at low temperatures and give adequate safety from crop damage.

The formulator is able to evaluate for his particular needs all the

important solvent characteristics except phytotoxicity. Adequate testing is usually the responsibility of the solvent supplier. Because this subject is of paramount importance to the formulator in the selection of the solvent, it is discussed in detail.

Amoco Chemicals chooses to have the plant toxicity of its solvents evaluated on the basis of field rather than greenhouse tests, because experience has shown that greenhouse data do not correlate always with the results from normal spraying of crops in the field. These tests are conducted by independent laboratories and supervised by qualified biologists, plant toxicologists, or plant pathologists. Field tests have shown that phytotoxicity can vary according to: (a) the type of solvent used, (b) the rate of application, (c) the method of application, and (d) climatic conditions.

Agricultural insecticide systems often utilize xylene-type solvents or heavy aromatic naphthas. Crops such as corn are sensitive to solvents, and xylene-type solvents are normally used in emulsifiable concentrates or granular preparations. The effect of different types of solvents when used on corn was established last summer in a field test in Iowa. Comparisons were

(Continued on Page 113)

Table III.
Phytotoxicity Comparison of Panasol AN-1, Panasol AN-2K, and a Competitive Heavy Aromatic Naphtha
Two Spray Applications per Crop

Solvent	Application Dates		Alfalfa	Broccoli	Carrots	Corn	Onions	Potatoes	Snap Beans	Soy Beans	Sugar Beets	Tomatoes	Wheat
			7/5	7/19	T	M	O	S	O	O	O	M	T
Seedling plus Flowering Treatment													
Panasol AN-1	7/5	7/19	T	M	O	S	O	O	O	O	M	T	O
Panasol AN-2K	7/5	7/19	T	M	O	S	O	T	T	T	M	T	O
Hvy. Arom. Naph.	7/5	7/19	T	M	O	S	O	O	O	O	M	T	O
Fruiting plus Pre-harvest Treatment													
Panasol AN-1	7/29	8/6	O	M	O	O	O	O	O	O	M	O	O
Panasol AN-2K	7/29	8/6	O	M	O	O	O	O	O	O	M	O	O
Hvy. Arom. Naph.	7/29	8/6	O	M	O	O	O	O	O	O	M	O	O

Rating: O—No injury.

T—Trace injury, pass undetected.

S—Slight injury, noticeable but not objectionable.

M—Moderate injury, noticeable, objectionable if plant growth inhibited or crop yield reduced.

LIQUID FERTILIZERS

A liquid fertilizer plant normally sells to customers in about a 15-20 mile radius. One producer, however, sees a good possibility of widening this area to 100 miles. He would supply a base mix formulation to a series of local, cold-mix blending plants. From it they could make a variety of complete fertilizer grades.

The following discussion is a continuation of "Agricultural Chemical's" report on the Southeastern Liquid Fertilizer Conference, held February 10-11 in Eatonton, Georgia. The first installment of this report appeared on pages 46 to 49 of the March, Issue.

Economics of Liquid Fertilizers—A Farmer's Viewpoint

ECONOMIST Roger C. Woodworth, Univ. of Georgia, and Wesley G. Smith, TVA, reporting on the possibility of expanded use of liquid mixed fertilizer by farmers in southeast states, indicated that according to their studies, "bulk spreading of dry fertilizer, and use of liquid fertilizers is likely to increase substantially in the years ahead for the following reasons:

1. Per acre fertilizer rates have been increasing and likely will continue to increase.
2. The cost of farm labor has increased and will continue to increase relative to most other farm inputs.
3. Higher costs and lower profit margins are forcing farmers to become more efficient in their production.
4. Farm units are getting larger.
5. Farmers have been and will continue to substitute capital for labor and land.
6. Many farmers are willing to pay something if necessary to eliminate lifting and tedious tasks. This is particularly true since application costs are small relative to total fertilization costs.
7. Because of the above factors, farmers are likely to pay more attention to improved timeli-

ness of operations and means by which the size of work crew can be reduced.

8. The process of bulk spreading of dry and liquid fertilizer is likely to improve through technological advance."

"The potential for liquid mixed fertilizers," they added, "will depend to an increasing extent on the competitive position with bulk spreading of dry fertilizer. Also, the use of liquid nitrogen and/or anhydrous ammonia will likely increase because of the lower unit costs and reduction in labor required."

Messrs. Woodworth and Smith compared fixed and total costs involved in using liquid fertilizers and offered the following conclusions on the economics of using this new fertilizer form:

1. Equipment costs are generally higher for liquid application than for dry fertilizer, particularly where wide-boom liquid applicator equipment is involved.
2. On a per acre basis, this difference is not large for many types of equipment, except when annual use is low.
3. The fixed per acre cost for liquid fertilizer attachments on planters is not materially higher than the corresponding dry

equipment costs for an annual use of 25 acres or more. Total per acre costs are lower for the liquid if there is a significant labor saving.

4. Equipment costs for broadcasting or topdressing with liquid fertilizer are generally somewhat higher than for dry application. However, total costs for the liquid application may be lower if the equipment has a high annual use. For example, comparing a \$650, 20 foot liquid applicator with a 10 foot dry distributor, the cost for the liquid is lower if labor savings are $\frac{1}{4}$ and the equipment is used for 275 acres or more per year. If labor savings are $\frac{1}{2}$, an annual use of 175 acres is needed. In some cases annual use of equipment can be extended by using it for liquid nitrogen and to spray crops.
5. The amount of labor saved may be highly significant if it allows (1) completion of critical planting operations within a shorter time period, (2) reduction in hired labor or size of crew. On some farms planting operations limit acreage so that simplified planting would allow an expansion in size of farm.
6. Farmers with limited investment funds must consider returns from alternative uses of funds, compared with use for liquid application equipment. In many such cases, continued use of present equipment for bag fertilizer will result in a higher farm income, even if acre application costs could be reduced somewhat by using liquid fertilizer.

The comments on this page review liquid fertilizer use from a farmer's standpoint. On the following pages, problems and considerations in selling and manufacturing liquid fertilizers from the manufacturer's viewpoint are discussed. One of the limitations in handling liquid fertilizer, is the distance to be travelled from a plant to customer—a possible answer to this, may be establishment of cold mix plants.

Production, Storage and Application of Liquid Fertilizer

EXPERIENCES in manufacture and sale of liquid mixed fertilizers were recounted by Morris T. Woosley, who organized West Kentucky Liquid Fertilizer Company in Hopkinsville, Ky., some three years ago. Production in the early stages, said Mr. Woosley, amounted to five to ten tons of finished fertilizer per hour, using a mixing tank and an arrangement to meter or weigh the raw materials. A reaction chamber and cooler were later introduced as a means of increasing production. These two improvements, he said, made it possible for the plant to produce about twenty tons per hour, and established the liquid manufacturer as a recognized part of the fertilizer industry.

In the past two years, said Mr. Woosley, TVA's developments with wet process phosphoric acid and use of superphosphoric acid as a sequestering agent in the wet acid, allow the liquid manufacturer to use wet process acid as an inexpensive raw material. At the same time, he pointed out, use of these new materials brought problems of their own. Superphosphoric acid is very sensitive to over ammoniation, and at the same time wet process acid reacts favorably to controlled high pH during the ammoniation process; thus both of these materials require close control over reaction temperature.

The need for efficient ammoniation control, plus the need for increased production per hour were factors in developing an improved Reactor Tube, said Mr. Woosley. This tube handles all three types of phosphoric acid, either as individual materials or the combination of super acid and wet process acid. This system enabled them to produce up to 40 tons of finished fertilizer per hour. It reduced raw material consumption and cut manufacturing cost. Mr. Woosley reported a savings of 15 cents per unit of P_2O_5 by using wet acid instead of furnace acid.

Since the average fertilizer grade contains 15 units of phosphate, this change was very important.

"Scope of efficient operation," he reported, "has been a limiting factor to the liquid manufacturer. A full scale liquid plant requires a sizeable investment, it requires trained personnel for efficient operation. Interest on capital investment, depreciation and expense of operation all come out of profits, therefore a liquid plant must produce and sell a fairly large volume to produce profits. As volume goes up, ton cost goes down and profit increases.

"The original conception of the liquid fertilizer industry was a series of small independent plants to serve areas within a radius of 15 to 20 miles from plant location. This would seem logical since a large part of all liquid fertilizer is being applied by customer spreader trucks. Distance traveled reduces the capacity of the custom operator to serve a large number of customers. Remote storage has not proven practical, because of the many grades necessary to meet varying crop needs.

"This problem prompted us to develop a cold mix blending plant.

With this system, the central plant produces certain base mix formulas that are transported by tanker truck or rail to the blending plant. There they are put in storage and blended to produce a variety of complete fertilizer grades. This blending plant is inexpensive. In most areas it would consist of three storage tanks, a metering system, a simple mixing unit and a pumping set up. In tobacco growing areas a fourth storage tank is necessary. Thus with a minimum of expense, the blending installation has all of the flexibility of grade production of the full-scale plant. This development has opened the door to greatly expanding the area served by the central plant. Today, plant production capacity, material supply and operating capital are the limiting factors of the liquid producer rather than area limitations. In our operation we are thinking in terms of a 100 mile radius instead of the 15 to 20 mile radius usually considered. This blending installation puts the liquid manufacturer on an equal basis with a larger solid fertilizer plant. I am confident," Mr. Woosley concluded, "that within the next 10 years there will be a liquid fertilizer installation, either cold mix or manufacturing unit, in every section of agricultural importance."

Corrosion Problems Involved in Liquid Fertilizers

RAW materials for making liquid fertilizers, and the finished formulations themselves are recognized as highly corrosive materials, thus construction materials for special attention must be given to construction materials for mixing and applying equipment.

W. W. Arnold, Nitrogen Division, discussed corrosion and corrosion problems in the liquid fertilizer industry, reviewing some of the acceptable materials for construction.

One of the most difficult materials to store from a corrosion standpoint is phosphoric acid.

Chromium-nickel stainless steels, and particularly type 316, are excellent for use with phosphoric acid, but are limited in use because of their high initial cost. Rubber lined steel tanks and flexible plastic liners in steel tanks are much more economical. A new development for the storage of 75% phosphoric acid is an asphalt and burlap lined pool. This appears to be very economical, especially for quantity storage, said Mr. Arnold. Pipe lines and valves for handling phosphoric acid should be stainless-steel, rubber lined or of suitable plastic such as polyvinyl chloride.

It should be remembered, however, that rubber linings and polyvinyl chloride are affected by temperature, and should not be used on lines where excessively high temperatures will be experienced.

Aluminum, reported Mr. Arnold, is the best storage material for tanks to handle nitrogen solutions other than aqua ammonia or anhydrous ammonia. Aqueous solutions of ammonia, commonly used as a source of nitrogen, and a neutralizing agent for phosphoric acid, can be stored in appropriately constructed mild steel tanks. On the other hand, aluminum has been found in field tests to be inadequate for use with complete liquid fertilizers. Corrosion takes place usually in the form of severe pitting. This corrosion on aluminum is accentuated at temperatures above ambient temperatures.

Either because of cost or corrosion, the liquid fertilizer industry has, in general, reported Mr. Arnold, turned to mild steel for storing and handling liquid mixtures. The biggest problem encountered with the use of mild steel is apparently an oxidation type of corrosion, which takes the form of rust scale. This scale sloughs off, and can create a considerable problem during field application by stopping up line screens, valves and metering orifices.

A new type of tank material is coming into use, which may eliminate many of the corrosion problems now being experienced with steel. Various polyester resins are being tested, and used for tank fabrication. These plastics are generally being reinforced with fiberglass for added strength.

Complete liquid fertilizers are usually made by neutralizing phosphoric acid with ammonia in a mixing tank or reactor tube. The materials of construction for this mixing equipment are for the most part stainless steel. There are specific cases where mixing techniques allow the use of mild steel construction, however, stainless steel is still recommended unless

very close control on acidity and temperature are maintained. Mr. Arnold pointed out that during the manufacturing process, the acidity of the solution may drop as low as pH 3, and temperatures ranging in the neighborhood of 240° F have been experienced.

pH control of the finished product is an important corrosion factor in the manufacture of fertilizer solutions. In general practice, these liquids are produced by reacting enough ammonia with the phosphoric acid to give an ammonia to phosphoric acid mole ratio of about 1.69. This corresponds to a nitrogen to phosphorus pentoxide weight ratio of 1 to 3. However, the 1.69 ratio is not the best for solubility, which is highest for many grades at a ratio of about 1.55 to 1.60. Reducing the

ammonia-to-acid ratio lowers the pH, and if the pH is lowered far enough, corrosion is increased. Therefore, a balance must be made between solubility and pH so that satisfactory solubility can be achieved, if possible, without lowering the pH to a point where corrosion is accelerated. From a corrosion standpoint a pH of 6.0 or higher is believed to be most desirable.

There are new products and new materials of construction being developed which will undoubtedly solve many corrosion problems now being experienced. "However," concluded Mr. Arnold, "we cannot assume that new construction materials will always work and it is wise to be just a bit skeptical about these products until they have proven successful."

Farmer Vs Custom Application of Liquid Fertilizers

"**I**S it best for the farmer to apply his liquid fertilizers, or have this job done by a custom operator?" Ralph Sasser of Kenansville, N. C. discussed various factors involved in this question, and observed that acreage and tonnage are the most important factors in deciding the economics of this question. "A farmer must consider the cost of owning and operating the application equipment, and figure the savings by applying his own material".

On the basis of applying equipment costing: (1) \$225, (2) \$450, or (3) \$650, Mr. Sasser presented figures showing that a farmer with 30 acres cannot justify even the least expensive of the machines. The farmer with 40 acres should not own the \$650 applicator, and the farmer with 60 and 100 acres should apply his own materials with the machine that suits his farming operation best for the most economical application.

Advantages to the farmer of custom application of liquid fertilizer include such benefits as: (1) more accurate distribution; (2) time saving on the part of the farmer; (3) elimination of costs of owning and maintaining equip-

ment; and (4) use of liquid and/or dry fertilizer to most economic advantage—he would not be limited in the kind of fertilizer to buy because of the application equipment owned.

Mr. Sasser cautioned, however, that custom application is only as good as the custom applicator. Excellent products might be faulted by farmers, if operators are inefficient in the field. Mr. Sasser also pointed out, however, that the custom applicator can do a very important selling job for the fertilizer industry. In selling his services, he is also selling fertilizer, and can be a very important link in expanding the market, as well as in introducing new products. A custom applicator represents less labor for a liquid fertilizer plant, since less time is spent changing tanks from one truck to another, — and less time is spent by the manufacturer in "trouble shooting".

A discussion on methods of application of liquid fertilizer was presented by J. C. Futral, Georgia Experiment Station. His full comments appear on page 57 of this issue.★★

*A special report for Agricultural Chemicals
prepared by H. H. Slawson
The pictures on these pages were taken
at the 1959 Farm Progress Show, held near
Clarence, Iowa.*



8th annual **FARM** **scheduled**

SOME of the nation's top manufacturers of fertilizers and farm chemicals are looking forward eagerly to next Sept. 21, 22 and 23. Those are the dates for the 8th annual Farm Progress show in which they will have a star role. This year's show is to be held on the Donald Baltz farm in Will County, Illinois, near the city of Joliet. Prairie Farmer Publishing Co., of Chicago, originator and continuous sponsor of the affair, says it's going to be "the world's biggest farm field day," and that's believable attendancewise and otherwise. From an attendance of 75,000 at the first Farm Progress show, a one-day affair back in 1953, this figure has climbed to 225,000 at the 2-day show near Clarence, Iowa, in 1959.

This year it will be a 3-day show and all the planning is being

made with the expectation that not less than 300,000 farm folks will take it in.

Planning for the 1960 show began almost as the curtain was run down on last year's show out in Iowa. They had 257 commercial exhibitors there, along with a number of strictly educational displays, including one from the state university at Ames. Illinois College of Agriculture at Urbana will take over that spot at Joliet.

Maynard Bertsch, bustling show manager, anticipates a considerably lengthened exhibitor list this year. On the Baltz farm he has laid out a 40-acre exhibit area for display of farm machinery, feed, seed, fertilizer, chemicals, petroleum and other crop production equipment and materials. On hand, too, will be makers of everything for the farm, from cow barn stanchions to bottled gas, hand tools for

the farm workshop or you name it.

Each will have a tent in which to display its wares, chat with their 300,000 prospects, pass out their sales literature by the half-ton truck load and see that the kiddies each get a balloon, a pencil or other advertising novelty.

For the farm women there will be a 1960 model farm kitchen display with continuous demonstrations of the latest in household "wife savers," plus cooking and style shows and a sewing center.

Out in the center of a 40-acre field, set off amid a landscaped lawn, will be the "Prairie Lady," a modern 3-bedroom farm house, built from top to bottom just for the 3-day run of the show. It will be furnished completely with everything a big Chicago mail order house has to offer for gracious farm living in the 20th century. Last year from 600 to 800 visitors were

put through this feature exhibit every hour, after most of them had stood in line an hour and a half.

There is no charge for exhibit space at this monster farm field day. But, note that exhibitors are required to be advertisers in one or the other of Prairie Farmer Publishing Co's three farm papers, *Prairie Farmer*, *Wallace's Farmer* and *Wisconsin Agriculturist*. You rent the tent and the management supplies electric power, water and phone service as requested.

Incidentally there is no admission charge at the gate and no parking charge in the 80 to 90 acres of parking space, arranged close to the 40-acre exhibit area. In this day and age Manager Bertsch has to think, too, of a land-



PROGRESS SHOW

for Sept. 21-23 in Will County, Ill.

ing strip and parking for farmers who fly their own planes. This airport is laid out with CAA approval. One year over 510 planes landed at the show grounds and more than 1,000 flying farmers signed the log book. For the 1960 show next September, the Joliet municipal airport will be used, Mr. Bertsch said.

Getting down to particulars of special interest to readers of *AGRICULTURAL CHEMICALS*, this Farm Progress show can be best described with the phrase used often by the television folks: "It comes to you live." There's a lot more to it than just static displays of bags of fertilizer or cans of insecticides on the tables in the booths.

On the opposite side of "Fertilizer street" where all these exhibits are lined up, there are a number of demonstration plots where corn or other crops have been growing since early spring.



Here, for instance, a fertilizer manufacturer will have opportunity to prove to visiting farmers that his product does exactly what he claims for it in his advertising copy.

Preparations for this remarkable "truth in advertising" demonstration begin at the Baltz farm just as soon as spring weather conditions permit plowing of the soil. Each exhibitor has furnished his materials with instructions for their use. Then he retreats to the sidelines and stays there in silence until the show gates open next Sept. 21. Mr. Bertsch with his crews of farm-trained helpers do all the rest.

They plow the plot, deep or shallow, as specified in the directions; plant the corn seed as instructed, put on the fertilizer, as starter or side dressing, or in combination, in the formulations specified; use herbicides on grass or weeds when the time comes; apply insecticides as frequently as needed for summer pest control; and in general look after each plot as solicitously as if it were their own.

Next fall the fertilizer manufacturer will be permitted to come in and point out to the swarming crowds just what his product has accomplished. Last year the 10 participating plant food companies used 52 fertilizer combinations on their plots and farmers could, with their own eyes, see and judge the results.

It's not possible to make comparisons of effectiveness between pesticides, but last year tests were run with herbicides on corn to show results where the plot was treated and cultivated, as contrasted with a plot treated but not cultivated. This, Mr. Bertsch said, gives the supplier graphic opportunity to show the farmers the effectiveness of the control measures taken.

This year considerable granular type insecticides will be used and also shown will be results from some chemicals not yet officially approved by the Food and Drug Administration. Mr. Bertsch men-

tioned "Amoben", for grass and weed control in soybeans and "Falon", for weeds or grass in corn. FDA approval of these is expected soon and the advance showing at Joliet will serve to acquaint farmers with what to look for when these chemicals are available to them commercially. If other new chemicals should show up before fall, Mr. Bertsch says "We'll give them a chance."

As of Feb. 1 ten fertilizer manufacturers had reserved demonstration plots for their use in September. The list, as supplied by Mr. Bertsch includes the following:

Virginia-Carolina Chemical Corp.; Nitrogen Div., Allied Chemical & Dye Corp.; Illinois Farm Supply Co.; Sohio; American Cyanamid Co.; Smith-Douglass Co.; Swift & Co.; Standard Oil of Indiana; Grand River Div., John Deere Co. Two more plots were available as of Feb. 1.

The list of exhibitors of farm chemicals, insecticides, herbicides, seed treatments, etc., for the 1960 show was incomplete on the date of the interview. Last year the following had displays: Geigy Agricultural Chemicals, Monsanto Chemical Co., Stauffer Chemical Co., Texaco, Thompson-Hayward Chemical Co., United States Rubber Co., and Velsicol Chemical Corp.

Out in the midwestern states of Illinois, Indiana, Wisconsin and Iowa, covered by *Prairie Farm* publications, soybeans are running a close second to corn as a leading farm crop, so there are demonstration plots for this "humble little bean" similar to those for corn. Each will have its sign board listing the materials used and the cultural practices followed by Mr. Bertsch's farm hands. In these plots, too, manufacturers of soybean combines will put their machines through their paces before the show is over.

Hybrid corn is another star in the big show. Last year farmers strolling down "Hybrid Lane" saw 152 hybrid corn varieties in the

plots of 15 seed firms. Three other companies provided seed for 16-variety sorghum plots and over 40 different fertilizer combinations were used here. There will be 200 hybrid corn varieties at Joliet this year and everything will be prominently labeled so visitors can have full information on how results visible to the eye were produced from use of the named firm's products.

The growing crops, of course, are excellent sources of supply for machinery demonstrations and on the plots farmer visitors will see in action late models of corn shellers and cutters, blowers, combines, stubble shredders, discing devices, what not. Somehow it all makes you think of that claim of the meat packers that "We use everything but the squeal."

There's nothing for sale at the Farm Progress show except food. Catering is turned over to local churches, usually eight in number from nearby towns. Last year the church workers sold over 3 tons of ground beef for sandwiches, another ton of sliced ham, 50 gallons of mustard and other menu items in similar Paul Bunyan proportions.

Each church has its own individual eating tent and all charge the same price, made possible by a cooperative purchasing program. They are allowed to keep all net profits, which last year aggregated \$28,000. Under their agreement with the show management, each church must spend its profits for the benefit of its own community.

There are no honky tonk side shows or games of chance anywhere around the Farm Progress show. It's a clean, agricultural education show, Mr. Bertsch emphasized. About the only thing that might be classed as entertainment is the fire fighting demonstration, put on each afternoon by the local firemen who patrol the grounds all day.

Nobody knows now just how this remarkable farm field day, biggest of its kind, got started, *Prairie*

(Continued on Page 110)

Ammonium Sulfate Market

It is the free ammonia content of nitrogen solutions which presents the most serious competition to sulfate of ammonia. The favorable cost per unit of nitrogen in the solutions has been stressed as the chief attractiveness of liquid fertilizers. This advantage, however, may be offset in many instances, by "salting out" problems.

The following is the conclusion of a report by Vincent Sauchelli, presented before the American Coke and Coal Chemicals Institute. The first part of this address appeared in the March issue of "Agricultural Chemicals," pages 30-32.

Part 2

by
Vincent
Sauchelli



Exploiting Advantages to Create Sales

IT seems to me the special advantages of ammonium sulfate may best be exploited through developments in the mixed fertilizer industry. The signs all point to a continuing increase in the application of chemical fertilizers to obtain the food and fiber needed by people in all countries of the world. In our country, nitrogen solutions, used for ammoniating acids and phosphates, dominate and have become the most serious competitor of sulfate in formulating mixed fertilizers. We have referred to the power of economics in this respect. All these nitrogen solutions contain free ammonia, which is the neutralizing agent; the manufacturer will try to use the maximum amount of this free ammonia compatible with maintaining the correct amount of available phosphate in the mixture. Another characteristic of these solutions is that they contain in solution, besides free ammonia, either ammonium nitrate or urea or both. The number of such solutions offered is large and they vary considerably, one from the other, in the amount of water and the ratio of free to fixed ammonia, as well as in physical properties. The solubility of the fixed ammonia compounds varies with temperature and to serve the trade in all climates the suppliers prepare solutions of high, intermediate and low concentrations of the ammonium nitrate and urea. Some producers also supply solutions containing sulfate of am-

monia in addition to ammonia, ammonium nitrate and/or urea. Problems connected with "salting out" occur frequently enough however to cause unexpected expenses in tank cars, pipe lines, storage tanks or in goods already bagged for shipment.

The favorable cost per unit of nitrogen has been stressed as the chief attractiveness of these solutions. This advantage in economy may be offset, in many instances, by showing the fertilizer manufacturer how economies and freedom from salting out experiences, can be realized by the judicious use of sulfate of ammonia. Furthermore, it may be possible to find locations in which the per-unit-of-nitrogen cost, in solutions, will be as much or even a little higher than in a combination of ammonium sulfate and anhydrous ammonia.

Let me emphasize again that it is not the fixed nitrogen compounds in these solutions, but the free ammonia, which gives the most serious competition to sulfate of ammonia. When the rate of ammoniation exceeds 2.5 to 3.0 per cent per unit of P_2O_5 in the normal superphosphate, special precautions are needed to prevent reversion of the available phosphate to less available forms. If the operating department decides to go beyond the 3 per cent ammoniating rate, it has to weigh the additional cost due to handling, aeration and the loss in value of the reverted P_2O_5 . This situation, that is, the desire to in-

crease the relative amount of nitrogen in the formula without loss, gives sulfate of ammonia an opportunity to get into the act.

It is well-known that many manufacturers of granulated mixed fertilizers are making their own solid sulfate of ammonia, in their mixtures, by causing excess sulfuric acid to react with the free ammonia of the solution. This is regarded as an economy measure and in most cases it may be. Heat is generated by the chemical reaction and this is advantageously utilized to evaporate excess water and improve the quality of the granulated product. Now here is the important question: Is the cost of this excess acid-free ammonia item a real economy compared with the actual cost of the same quantity of purchased sulfate of ammonia plus mixing with the other components? This is a cost item that needs to be evaluated at each fertilizer plant, of which no two seem to be alike. The cost is influenced by the combined effects of plant location, freight rates and handling charges. The acid may be either new or "spent."

It is possible to give only a general example of the way an operating officer would have to study his comparative costs in order to make a wise decision on whether to form ammonium sulfate *in situ* in the mix, as explained previously, or to purchase the sulfate.*

The cost of sulfuric acid has been varying from \$18 to \$25 per

*Prices are assumed and used merely to illustrate the examples given.

Table 3. Nitrogen Costs Per Ton Ammonium Sulfate Equivalent From Anhydrous Ammonia and Nitrogen Solutions—Destination Blank (An Example)

Material	Nitrogen	Freight Cost			Total Cost	
		Per Ton Solution	Per Unit N	Per Unit F.O.B. Cost Nitrogen	Per Unit N	Per 21 Units N
Anhy. Ammon.	82	10.42	.127	1.073	1.20	25.20
Sol. X	41	6.63	.162	1.28	1.442	30.282
Sol. Y	41	6.63	.162	1.28	1.442	30.282
Sol. Z	37	6.63	.179	1.28	1.442	30.639

ton of 66° Be acid equivalent. The cost of ammonia may be, say, \$88 per ton f.o.b. production point. Freight will vary depending upon distance and mode of transportation. Anhydrous ammonia contains 82 units of nitrogen per ton and may cost about \$1.20 per unit delivered to the fertilizer plant, depending upon freight charges.

Now, to produce one ton of 21 per cent ammonium sulfate, requires 0.73 ton of 66° Be sulfuric acid and 21 units of nitrogen. Using the above costs, we get:

21 units of N @ \$1.20	\$25.20
0.73 ton H ₂ SO ₄ @ \$22.00 per ton	16.06
Total cost per ton	\$41.26

Let us assume that this same superintendent has a list of the various ammoniating solutions available to him from several suppliers to use in his comparative study. He would list material, amount of acid required for each solution, the acid cost in each case and the nitrogen cost per ton of ammonium sulfate equivalent and then calculate the total cost. Let us say he has the choice of 3 solutions, which we shall designate as X, Y, Z, respectively. Then we have the tabulations shown in Table 3.

Having studied these data, he is able to decide on his course of action. He compares the cost of purchased sulfate of ammonia with the equivalent amount to make in situ by causing excess acid to combine with the free ammonia of a solution. Note how the total cost per ton of sulfate equivalent varies with the several solutions. These would have to be compared with sulfate from his nearest coke oven supplier which may also vary, depending on freight, etc.

A representative from the coke-oven sulfate of ammonia supplier would sit down with a prospect and show him how to make such an analysis in order to arrive at a just evaluation of his operation. In fact, he might have the analysis already prepared, at least in outline form, prior to his visit. This is one of the methods of "hard sell" that needs to be considered in this market, if competition is to be overcome.

Freight rates have increased quite considerably in the past few years and this has in many cases caused solution manufacturers to provide larger equalization points for their materials or lose certain markets. All such changes need to

be carefully evaluated by sulfate of ammonia suppliers in their search for more business.

Concluding Observations

BY-PRODUCT coke-oven sulfate of ammonia is at present in short supply; or at least, owing to the steel strike, there may be no carryover. Producers may feel easy now about marketing their product, but should not be too complacent. They have seen what their competitors are doing with synthetic ammonia products and the problems they face in the domestic and foreign markets. They are an aggressive, well-organized group and will fight every inch of the way to keep and expand their markets.

Ammonium sulfate should be able to maintain its present tonnage and perhaps even gain some during the next decade. To do this it will have to secure some of the direct application tonnage and of the bulk-blend market. As a conditioner in mixed fertilizers—a popular use for it now—it may lose its appeal in that market. However, as already pointed out, it does have a good place as a supplier of the top 2 or 3 units of nitrogen in the high-nitrogen grades. T. P. Hignett, chief of the TVA Chemical Engineering Department, has declared that the best practice for getting well-controlled granulation is to use a certain amount of sulfate of ammonia in the formulation. TVA usually includes 20 to 100 pounds of nitrogen, from sulfate of ammonia, in formulating a granulated 10-10-10 or 12-12-12 fertilizer grade.

Another advantage that should

(Continued on Page 111)

Table 4. Estimated Cost of Acid to Neutralize Free Ammonia and Total Cost Per Ton Equivalent of Ammonium Sulfate (21% N) (An example)

Material	Free Ammonia N%	66° Be Acid to Neutralize Free NH ₃	Estimated Cost/Ton		
			Acid	(NH ₄) ₂ SO ₄ Equiv.	Cost/Ton (NH ₄) ₂ SO ₄ Equiv. Nitro. Gen. Total
Anhy. NH ₃	100.0	.73	\$22.00	\$16.06	\$25.20 \$41.26
Sol. X	44.4	.324 (44.4% of .73)	22.00	7.128	30.282 37.41
Sol. Y	52.6	.385 (52.6% of .73)	22.00	8.47	30.282 38.75
Sol. Z	37.0	.370 (37% of .73)	22.00	5.94	30.639 36.58

Pesticide Technology

The pesticide manufacturing process usually consists of a series of phase reactions with intermediate steps of purification. It is operated batchwise, using standard equipment useful in multi-step operations.

The discussion below reviewing equipment and operations for a pesticide production process is based on a report presented by H. R. Moody at a Pesticide Symposium for the American Institute of Chemical Engineers, during their annual meeting held February 21-24, 1960 in Atlanta, Georgia.

Moody at a Pesticide Symposium for the American Institute of Chemical Engineers, during their annual meeting held February 21-24, 1960 in Atlanta, Georgia.

Mr. Moody is research supervisor and superintendent of the Semi-Works in the Research Division of Rohm & Haas Company. He is a chemical engineering graduate of M.I.T., and a member of ACS, NSPE, and AIChE.



H. R. Moody
Rohm & Haas Co.
Philadelphia

IT is rare that a new pesticide process is developed as a fully continuous process, except in a special situation, perhaps, where it might be necessary to reduce the in-process quantity of exceptionally hazardous materials to a minimum. A pesticide production process usually consists of a series of heterogeneous phase reactions with intermediate steps of purification.

The manufacture of a new compound might start out as a three-stage process, with ten to fifteen operations in each stage. If each reaction, washing and extraction step were to be designed for continuous operation, the plant would be unnecessarily complex. With markets of the scale and security of petrochemicals, certainly, continuous processes are readily justified. But as with other specialty chemicals, pesticides are usually relatively low volume, one-end-use products, subject to the hazard of early mortality, because of obsolescence by new compounds or the unpredictable reactions of nature.

Specific types of equipment are particularly useful in pesticide manufacture,—these are primarily batch units, which are useful in multi-step operations. One of the most attractive features of a plant built of these units, is its versatility, which permits its use in other processes, in the event of early obsolescence of the product,—a not uncommon occurrence. Equipment for the pesticide plant includes: reactors, toxic facilities, special

services (heating and cooling units), equipment for: filtration, drying, grinding, and mixing. Unit operations most common to pesticide manufacture concern distillation for the recovery of solvents or purification of product, extraction for purification of the product, grinding, drying and mixing.

Some of the equipment used commonly in a "semi-works" pesticide development program is described below:

Glass Lined Kettle. The key unit in pesticide production is probably a glass-lined kettle, fitted with a variable speed drive agitator, glass-lined condenser and receiver, along with the usual temperature and pressure instrumentation, plus services for heating and cooling. Most conditions of pressure range from full vacuum up to 25 psig. A 100-gallon size unit has been most useful. If necessary, it can be geared up to produce several thousand pounds a month of product for field trials and early sales activity. The 100-gallon unit gives dependable scale-up information. A further auxiliary is a glass scrubber for obtaining material balance data and protecting the vacuum jet against corrosive attack. A kettle, scrubber, and auxiliaries may represent an investment of about \$35,000.

For systems not requiring glass, a stainless steel kettle offers the advantages of better heat transfer and agitation. Minimum auxiliaries would consist of a variable

speed drive agitator, a 30 ft² condenser, a 50-gallon portable receiver, and temperature and pressure recording instruments. Working pressures usually fall in the range of 50 psig down to full vacuum. An investment of about \$30,000 is involved.

Special Services. Steam at 100 psig will take care of most heating requirements. However, a 100,000 BTU/hr, electrically heated Dowtherm unit makes temperatures up to 300° C possible. Installed cost is about \$20,000.

Cooling usually can be accomplished with normally available plant service.

Most operations don't require pressures below 5 mm Hg. abs.; however, a four-stage jet, which can reach 1 or 2 mm is necessary occasionally. With corrosive systems that cannot be cleaned up by a scrubber, special materials of construction, such as Karbate are recommended. Without surface condensers to reduce the contamination of the effluent condensing water, the investment is about \$5,000.

Filtration Equipment. A six frame, 12-inch stainless steel filter press is needed frequently. Cost is about \$5,000. A pump will add \$3,000. Another useful unit is a 3' x 3' x 2' wood filter box, cost — \$1,000.

Most separations can be made on a filter box or press. Unless there is a special problem in separation, or unless a very dry cake

is essential, the filter box or press will be adequate. A two foot diameter basket centrifuge will cost about \$15,000.

Drying Equipment. Because of the heat sensitivity of many organic pesticides, flash and low temperature drying methods are employed frequently. A spray drier is very useful for solutions and slurries. A laboratory size model, which will evaporate up to five pounds an hour of water at temperatures of 200°-300° F., has been found to be useful in determining the feasibility of such an operation and providing samples of product. An investment of about \$10,000 might be required.

In our experience, the purchase of a semi-works scale unit is unnecessary, and in some ways undesirable. A number of equipment suppliers are willing to make extensive runs to obtain process data or to support semi-works scale production. Cost for a day's run in commercial scale units amounts only to \$200 for an eight-hour run. It is difficult to justify, economically, the purchase of a larger scale developmental unit. The most serious problems encountered are concerned with obtaining the desired particle size and in providing against air pollution.

A tray drier is a quite necessary tool, particularly for preparing varying quantities of product. Good yield data are possible. A 20 tray (28" x 38" x 1") atmospheric unit will permit prepara-

tion of 100 pounds a day, and cost about \$10,000. A six tray (24" x 24" x 1") vacuum unit will cost about \$6,000.

Since a vacuum tray drier is rather inefficient from the standpoint of heat transfer, a rotary or drum drier can be used. Such a unit, however, is not essential, since tests can be run in the supplier's facilities. A 2-foot diameter by 4-foot long stainless steel unit can process a couple of hundred pounds a day and costs about \$10,000.

Grinding Equipment. Most pesticide wettable powder and dust formulations require comminution to a particle size of less than five microns. The hammer and air attrition mills have been the most useful. The former will not grind as fine as the latter, but it is the work horse, and is simple to operate.

Mixing Equipment. A dry mixer of the ribbon blender variety is useful for preparing dusts and wettable powders as well as for final blending. A twenty cubic foot stainless steel unit with a jacket for steam heating will support production of several thousand pounds per month, and costs about \$11,000.

Plant Scale Operation

SCALE-UP of most batch operations is usually quite straightforward. However, a wide variety of challenging problems face the plant technical superintendent.

Versatile semi-works and plant scale facilities, as contrasted with specialized continuous units, are valuable assets in developing a workable process for pesticide manufacture and avoiding some of the hazards of product obsolescence

Because operations are never at a steady state, the need for holding to specified but variable conditions and correcting unanticipated new variables (such as a change in raw material quality), close and competent supervision, supported by skilled trouble-shooting groups, are all essential.

Problems of scale-up of batch equipment are not particularly profound. Perhaps the most important problem for the engineer is to recognize early the limitations of the plant equipment, and take into account such factors as the lower heat flux and longer times for reaction. Special problems sometimes arise where a product will plate out on heat transfer surfaces. A ready solution to heat removal in such systems, or in very viscous media, is to reflux some inert solvent. It is particularly advantageous to make runs in 100 gallon vessels, because the scale-up is convenient.

Another scale-up problem is in fluid flow. In addition to obtaining good power and speed measurements, observation of the actual physical condition of the mixture is essential, particularly with heterogeneous systems. Misleading power data can be obtained when a low density slurry floats above the agitator. A challenging problem is encountered in extracting organics, particularly if any of the materials in the system have unusual surface active properties. Optimum conditions must be found to assure intimate contact of the different phases, but avoiding conditions that are vigorous enough to produce emulsification.

Even before the market is fully developed, the sales department begins to exert pressure to reduce costs and improve quality. Such conditions, of course, are commonly present in the manufacture of all specialty chemicals.

Some comment needs to be made on the importance of periodic reviews of process economics in order to keep a development

program on course. Cost estimates emphasize which areas of investigation are likely to pay the biggest dividends. Such problems as balancing stringent purity requirements against intricate purification procedures and yield losses are best reviewed by economic studies, obviously.

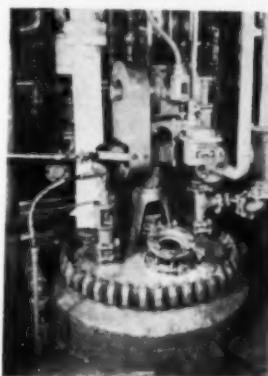
Cost estimating can be simplified considerably by use of a kettle-hour concept, instead of the usual job or process costing procedures common to accounting operation. The method consists of taking the total of the costs of operating a department for a batch type operation, and dividing by the number of reactor or kettle hours used during the month. If the kettles vary in size, a volume factor should be applied. Then, to find the cost of making a batch, simply determine the product of estimated running time and average "effective" kettle hour cost. With experience, surprising good preliminary estimates can be prepared in this fashion, even using factors for plants fairly dissimilar in activity.

Safety

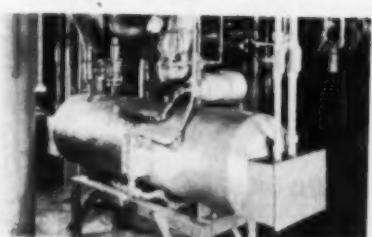
SAFETY is a prime consideration all through development of a pesticide program, and through all full scale plant production. Since operations are usually carried out by a lay operating staff, and because conditions are constantly changing,—unlike a continuous process, the engineer must be particularly vigilant to set up safeguards to avoid blundering into danger. A special area is suggested for handling with safety particularly obnoxious chemicals, such as hydrogen sulfide, carbon disulfide, hydrogen cyanide, mercaptans, acid chlorides, and chlorine.

Versatile semi-works are valuable assets in developing a workable process for manufacture and avoiding in advance some of the hazards which might possibly otherwise be encountered.★★

Pesticide Processing Equipment



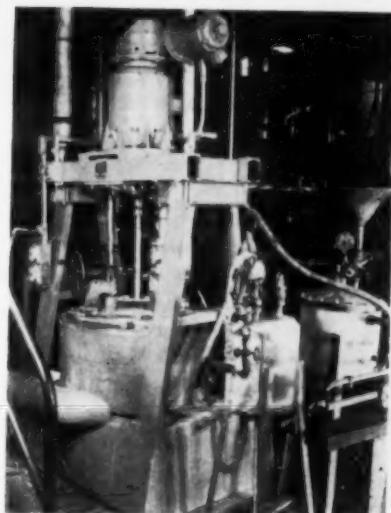
100-gal. glass lined kettle



Electrically heated Dowtherm boiler



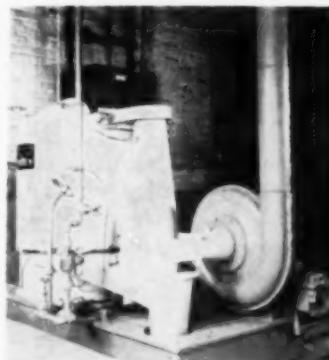
Air attrition mill



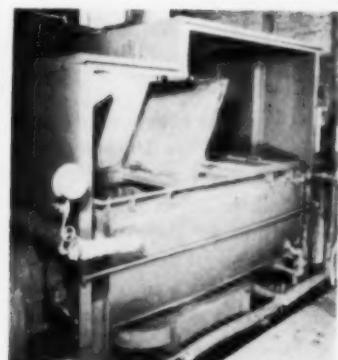
Basket centrifuge



Tray drier



Spray drier



Jacketed Ribbon Mixer

'59-'60 Fertilizer Supplies Expected To Rise

SUPPLIES of fertilizer materials for 1959-60 are expected to total 8,085,000 tons of plant nutrients—nitrogen, phosphate, and potash—according to a preliminary report prepared by Harold H. Shepard of the Commodity Stabilization Service, U. S. Department of Agriculture. This tonnage is 5.2 per cent higher than the unexpectedly large total of 7,685,000 which was available in 1958-1959, when supplies proved to be 14 per cent greater than in 1957-58.

Despite the increase in total supplies, such factors as the growing complexity of the industry, the need to provide the variety of materials demanded, and the increasing quantity of fertilizers that must be moved in a short period of time, are expected to create apparent scarcities in the midst of plenty, the report stated.

Estimates of supplies for 1959-60 shown in the report are based on stock trends, rates of production, and foreign trade during the first six months of the fertilizer year. Although 70 per cent of sales are made in the last four months of the fertilizer year—which runs from July 1 to June 30—from 40 to 55 per cent of primary fertilizer materials are manufactured in the first six months. Production schedules are based on sales anticipated by primary producers and mixers as reflected by the attitude of dealers and farmers.

Rates of production during the first half of the 1959-60 fertilizer years were above those of last year and it is believed that they will continue so during the last half of the year. December production was the largest of any month in the history of the industry for anhydrous ammonia, fertilizer grade ammonium nitrate solution, synthetic ammonium sulfate, ni-

tric acid, urea, and wet process phosphoric acid.

Nitrogen Up 11 Per Cent

Supplies of nitrogen for fertilizers in 1959-60 are expected to total 3,071,000 tons (table 1), an increase of approximately 11 per cent over the previous record quantity for 1958-59.

Ammonium sulfate is in better supply than had been anticipated. Production was reduced less as a result of the steel strike than

many feared and, during the rest of the fertilizer year, it is expected to be at a high level. Producers of synthetic sulfate helped to bridge the gap. Production of fertilizer grade ammonium nitrate solution continues to climb, the report said, and is enough to provide increased supplies of solid ammonium nitrate, of ammonium nitrate solution, and of ammonium nitrate-limestone mixtures.

Ammonium phosphate produced for shipment as such also

Table 1. NITROGEN: estimated supply of nitrogen for fertilizer purposes, 1958-59 and 1959-60, United States and possessions (1,000 short tons of N)

Item	1958-59 ¹	1959-60
<i>Supply from domestic sources</i>		
<i>Solids:</i>		
Ammonium nitrate ²	415	439
Ammonium sulfate ²	364	346
Urea	115	131
All other solids	208	238
Total solids	1,102	1,154
<i>Liquids:</i>		
Ammonia (including aqua)	827	925
All other	770	895
Total liquids	1,597	1,820
Total (solids and liquids)	2,699	2,974
<i>Imports</i>		
Ammonium nitrate	77	45
Ammonium sulfate	38	60
Urea ²	14	19
Ammonium nitrate-limestone mixtures	26	26
Sodium nitrate	72	76
All other	67	90
Total	291	316
<i>Exports</i>		
Ammonium nitrate	31	25
Ammonium sulfate	86	80
Urea	38	16
Ammonia (including aqua)	38	62
All other	30	36
	223	219
NET DOMESTIC SUPPLY	2,770	3,071

¹ Revised.

² Adjusted for estimated quantity going into non-fertilizer uses.

5 Per Cent

will reach a new high level in 1959-60, as will liquid nitrogen supplies, which will rise to about 61 per cent of the domestic supply of nitrogen. In every month from July through December, anhydrous ammonia production was at a record high for that month, and December production was the largest ever for any month. Production for July through December was 21 per cent greater than in the same period last year.

Domestic production of urea is at a rate of about 35,000 tons of N ahead of last year. About 24,000 tons of this will be fertilizer grade, liquid and solid. By-product ammonia capacity was about 220,000 tons of N on Jan. 1.

Phosphate Supply To Rise

The report estimates that supplies of P_2O_5 for 1959-60 will total 2,761,000 tons (table 2), or 3.6 per cent more than were available in 1958-59. Normal and enriched superphosphate supplies, however, will be smaller than they were last fertilizer year unless production is accelerated to fill P_2O_5 needs for less available concentrated products. Even though the supply of concentrated superphosphate is expected to be larger this year than last, the report warned, this material is in tight supply and may be very short during the season's peak.

Ammonium phosphate supplies as such will be up about 63,000 tons of P_2O_5 . Other phosphates will be up about 52,000 tons, principally as ammonium phosphate produced in combination with potassium salts and phosphoric acid for direct application and mixtures (liquid and solid).

Phosphoric acid (wet and furnace) in 1958-59 totaled an estimated 138,000 tons of P_2O_5 , less

than anticipated mid-way of last season. For 1959-60, the total is expected to be about 194,000 tons, a net increase of 56,000 tons.

Producers of elemental phosphorus are expanding facilities

and one furnace acid plant is under construction. How much of the increased supply will be available for fertilizer purposes has not been indicated, however.

(Continued on Page 119)

Table 2. PHOSPHATE: estimated supply of P_2O_5 for fertilizer purposes, 1958-59 and 1959-60, United States and possessions (1,000 short tons of available P_2O_5)

Item	1958-59 ¹	1959-60
<i>Supply from domestic sources</i>		
Normal and enriched superphosphates	1,400	1,346
Concentrated superphosphate	900	916
Ammonium phosphate ²	186	227
All other ³	318	378
Total	2,804	2,867
<i>Imports</i>		
Ammonium phosphate	42	69
All other	22	15
Total	64	84
<i>Exports</i>		
Normal superphosphate	36	29
Concentrated superphosphate	143	130
Ammonium phosphate	15	20
All other	10	11
Total	204	190
NET DOMESTIC SUPPLY	2,664	2,761

¹ Revised.

² Liquid and solid ammonium phosphate shipped as such by primary producers.

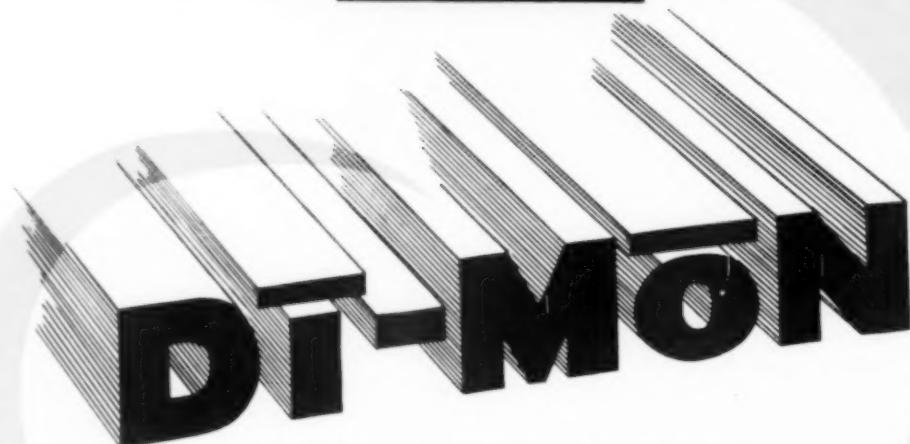
³ Includes ammonium phosphate (produced in combination with potash salts to make mixed fertilizers), nitric phosphates, sodium phosphate, wet base goods, calcium metaphosphate, natural organics, phosphate rock and colloidal phosphate, basic slag, and estimates of wet and furnace phosphoric acid for liquid and solid mixed fertilizers and direct application.

Table 3. POTASH: estimated supply of K_2O for fertilizer purposes, 1958-59 and 1959-60, United States and possessions (1,000 short tons of K_2O)

Item	1958-59 ¹	1959-60
<i>Supply from domestic sources</i>		
Potassium chloride	2,180	2,205
Potassium sulfate ²	123	127
All other	20	20
Total	2,323	2,352
<i>Imports</i>		
Potassium chloride	177	218
Potassium sulfate ²	37	35
All other	24	18
Total	238	271
<i>Exports</i>		
Potassium chloride	284	346
Potassium sulfate	17	14
All other	9	10
Total	310	370
NET DOMESTIC SUPPLY	2,251	2,253

¹ Revised.

² Includes sulfate of potash-magnesia.



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CONTROL of cotton insect pests, problems and progress in weed control on cotton, and the fertilizing of cotton for optimum production were among topics discussed at the Western Cotton Production Conference held in Bakersfield, Calif., March 1 and 2. A three-man panel discussed insect problems and offered recommendations for control during 1960 in California, Arizona and New Mexico.

Insect Control problems in California were outlined, and recommendations for control suggested by John E. Swift, extension

lowing application techniques that will minimize such drift and possible contamination.

John J. Durkin, extension entomologist at the University of New Mexico, reported that the biggest problem in counteracting insect damage to cotton in that state is to get cotton growers to appreciate the value of investing in pesticides when needed. "We have to show them," he commented, "that insects can be controlled and that chemical insect control, when necessary, pays dividends." He emphasized the importance of employing the correct pesticide.—

emphasized that the goal is not "control," but rather complete eradication. During 1959 75,000 acres were sprayed with DDT and the result was a complete success. Only one minor report of infestation was received following the program. He warned against premature optimism, however, and reminded that just "alternate year" treatments cannot be counted on to do the job.

Cost of the successful 1959 program was broken down as follows:

Application	\$686,772
Insecticide	551,093
Overhead	223,249

The estimated cost for continuation of the program for 1960 is from \$450- to \$475,000.

Richard B. Bahme, western regional director for N.P.F.I., stressed that fertilizer is one of the most productive purchases a cotton grower can make. No general fertilizer program can be recommended, he observed, and each grower must determine what specific program fits his individual needs. He added that western cotton farmers profit the most from fertilizer when its use is combined with efficient use of irrigation water, and "as water costs get higher, many cotton growers will find additional profit from extra dollars spent for fertilizer to insure the greatest return from irrigation."

Discussing use of herbicides in cotton, P. J. Lierly, agronomist at the Texas Agr. Exp. Station, El Paso, emphasized that use of these chemical tools must be a specialized, precision operation. Layby herbicides are a big step forward in controlling weeds in cotton, he believes, but they are not effective under all conditions. Since herbicides are potentially dangerous to cotton plants, a technique and rate of application must be employed which will kill the weeds, without injuring the cotton. The ideal situation, he suggested, is to let the cotton plants become older and larger before treating, but treat

(Continued on Page 117)

Weed & Insect Recommendations Told At Western Cotton Meeting

entomologist. The growth of resistance to pesticides is causing concern. All four species of spider mites found on California cotton have been reported from one locality or another to exhibit resistance to phosphorous miticides. Resistance to the chlorinated hydrocarbon pesticides has been developed by lygus bugs, the beet armyworm, salt marsh caterpillar, southern garden leahopper, conspersus stink bug and the cabbage looper.

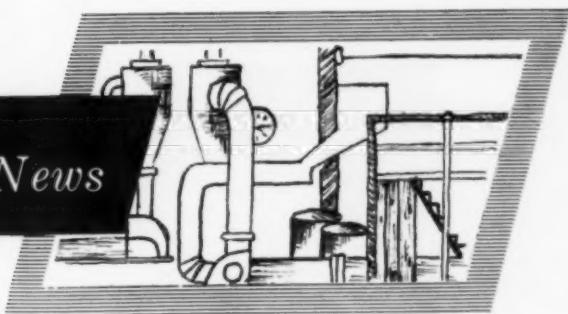
Unnecessary pesticidal treatments, Mr. Swift reported, continue to be a major problem. When unnecessary treatments are made, production costs are raised needlessly, populations of beneficial insects are reduced, and the development of resistance is accelerated. The problem of drift is also assuming major importance. When cotton is under treatment, drift of the pesticide to nearby alfalfa fields may result in contamination of dairy products. He emphasized the importance of fol-

and the correct timing of application.

Control problems and recommendations for Arizona were discussed by J. N. Roney, extension entomologist. He observed that they are still finding it difficult in Arizona to convince the cotton farmer that it is important to control sucking insects such as lygus and black leahopper. They must be controlled, he emphasized, if yields are to be raised. If not kept in check, they destroy all sizes of squares. Applications as far apart as three weeks, he commented, are useless. Two or more applications at 7 to 10 day intervals are required to achieve control, and correct timing is essential. Records quoted by Mr. Roney indicate that Arizona's highest per acre yields of lint were obtained where the highest poundages per acre of insecticide were applied.

The 1959 pink bollworm control program in Arizona was covered by B. C. Rhodes, of the Arizona Cotton Growers Assn. He

Fertilizer Views and News



New Granulation Technique Based On Crystallization In Oil

A NEW process of forming prills led fertilizers was described at a meeting of the Fertilizer Society in London, England, in January, by P. J. van den Berg and G. Hallie, of the Dutch State Mines (Staatsmijnen). The process is based on the crystallization of droplets of calcium nitrate in a mineral oil to which seed crystals have been added. After crystallization, the solid prills and the oil are separated by centrifuging. The principles of the process have been laid down in several patents and patent applications (British Patent No. 794855).

The process was developed for a calcium nitrate fertilizer, used widely in Holland as a top dressing. The calcium nitrate is obtained as a by product in the manufacture of nitrophosphate, but needs to be processed to a suitable fertilizer form.

Main investigations carried out by van den Berg and Hallie were: formation of uniform drops and the effect of oil on drop formation; process of heat transfer in relation to the dimensions of the apparatus and the temperature; separation of oil; and the required strength of the prills; properties of the final product; and outline of the pilot plant.

Advantages of the process are reported to be as follows: "Controlled crystallization in a medium with excellent heat transmission properties makes it possible to manufacture prills of a regular shape and the desired size, while

the height of fall in this medium is very small.

"When the oil has been centrifuged off, the prills are still coated with a thin film. Addition of special substances to the oil, therefore, makes it possible to obtain a film which reduces the rate of moisture absorption considerably, and gives the prills a dry appearance. Another advantage is that dust formation is suppressed and the product has excellent storage and handling properties."

In the manufacture of calcium nitrate prills, a nitrogen content of 15.5 to 15.6% and a molar ratio of about 5.2 is necessary. If the latter is higher, the solution becomes too viscous, while the molar ratios below this value have an unfavorable effect on the storage properties of the final product. The moisture content is 15.9%. Under these conditions, the oil content of the prills is almost maximum.

Investigators van den Berg and Hallie point out that to achieve a lower moisture content, inert material can be added; further evaporation is then necessary to reach the required nitrogen content. In the Dutch State Mines process, where the calcium nitrate crystals are obtained as a by product, the solution contains about three per cent of inert material. The solution must be evaporated to 12.35% moisture to maintain the required nitrogen content. The oil content of the prills is then very low.

It is of course desirable to keep the oil content of the final product as low as possible,—primarily from an economic standpoint. Most of the oil is removed by screening, the balance by centrifuging. These operations, however, only reduce the amount of oil adhering to the prill surface. The prills also contain an enclosed oil, hence measures must be taken to prevent the oil from penetrating into the prills during crystallization.

The amount of surface oil adhering to calcium nitrate prills with a diameter of about 2.5 mm will be about 4%. The amount of enclosed oil depends on the amount of liquid phase present before crystallization, and on the portion of this amount which crystallizes before centrifuging. To make crystallization proceed smoothly, seed crystals containing the double salt $5 \text{ Ca}(\text{NO}_3)_2 \cdot \text{NH}_4 \cdot \text{NO}_3 \cdot 10\text{H}_2\text{O}$ are added to the oil. The solution crystallizes out in the form of this double salt.

In the report presented before the Fertilizer Society (and reported in some detail in *Chemical Age*, January 30, 1960), van den Berg and Hallie indicate that the height of the fall required in their process is only a fraction of the usual height of air prilling towers,—no specific figure, however, is cited. A calculation of the approximate height of tower can be made, of course, by applying the formula based on falling time and falling velocity of a prill of given size. Readers are reminded, however, that this is only an approximation.

★★



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- Louisiana Group Meets
- Reducing Herbicide Drift

Dr. August Raspel, head of the Aerophysics Department at Mississippi State University, was featured speaker at two recent applicator meetings where he discussed technical aspects of agricultural airplane design and equipment and demonstrated a model of his proposed small plane that could be adapted for agricultural work.



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Diamond Chemicals

APPLYING LIQUID FERTILIZERS

By J. G. Futral

Georgia Experiment Station
Experiment, Georgia

LIQUID fertilizers may be applied to soil or crops in the same ways that solids may be with the exception of broadcast applications. Although there are a few crops which will tolerate direct sprayed liquid applications with little damage, it is safer to dribble the liquid in band of 10" to 14" when top-dressing crops.

Gravity Flow Equipment

The simplest application equipment for liquid fertilizers employs gravity flow. The liquid is fed from a tank directly to the outlets mounted below the tank level. This has the following disadvantages:

- (1) A constant tractor speed must be maintained.
- (2) The output rate will decrease as the liquid level in the tank drops.
- (3) There is not enough pressure to distribute the liquid uniformly along a long boom.

It has the advantage of being inexpensive and simple.

Constant Head Gravity Flow

The use of constant-head gravity flow units eliminates the disadvantage of varying flow rate since the outlet pressure remains the same regardless of liquid level. In addition, this type of unit may be calibrated for row crop use without the need for valve or orifices. Otherwise it has the same disadvantages as the gravity flow type. Directions for the construction of several variations of this type have been published in Mimeograph Series N.S. 35 of the Georgia Experiment Station.

Constant Pressure Type

A third type of equipment uses

The use of liquid fertilizers does not present any extraordinary equipment problems but the various methods for application should be compared before special equipment is constructed. Liquid fertilizer units should be simple and rugged in construction.

a pump to supply a constant pressure to the outlet lines. This has the advantage of being easily converted to an insecticide or herbicide applicator but also has the following disadvantages:

- (1) A constant driving speed must be maintained.
- (2) Pumps and pressure regulating valves require considerable maintenance.
- (3) Unless carefully strained by line strainers, the regulating orifices may become plugged.

One variation on this type of unit is to apply pressure to the tank with an air compressor. This eliminates pump and regulating valve troubles, but requires a tank strong enough to withstand the highest pressure used. With the exception of this initial cost disadvantage for a heavy tank, compressed air is probably more satisfactory than the pump-valve system.

Piston Pump Unit

A fourth type of equipment uses a piston pump driven at speeds proportional to the ground

covered. This is the most accurate method, since it is not necessary to maintain exact driving speeds. However, when using a long boom with many outlets, it is necessary to carefully match the outlet orifices to the pump output so that the entire pumped volume will be distributed evenly. This may cause trouble when large changes in application rates are made from field to field.

A variation of this type of equipment uses the hose or squeeze pump, which utilizes the action of rollers squeezing plastic tubing to meter out liquids. This is also driven at speeds proportional to the ground covered and since there is in effect a separate pump for each outlet, no orifices are needed. However, it is difficult to replace the tubing at just the correct tension so that all outlets deliver the same amount of liquid, and for this reason, manufacture of these pumps has been discontinued by two manufacturers.

The construction of liquid fertilizer units should be simple and rugged. All available information about the corrosion resistant properties of materials should be obtained before selecting one. For example, of the hundreds of stainless alloys, only a few may be satisfactory since stainless corrodes badly under some conditions. All tank and fitting welding should be done with inert gas or heliarc welders, which can weld more metals including aluminum and stainless. Ball or plug valves are cheaper and more satisfactory than several other types tried. Gear and roller pumps fail rapidly when any solid materials, even very finely divided ones, are present. Diaphragm, piston, and centrifugal pumps are satisfac-

(Continued on Page 110)



Above (left to right): Dr. R. D. Lewis, director, Texas Agricultural Experiment Station; J. H. Henley, TAAA; Louis A. Liljedahl, USDA; Roy Sims, Texas Flying Farmers & Ranchers Assn.; Asa

Burroughs, Texas Aeronautics Commission; W. A. Lewis, president, TAAA; Dr. Wayne G. McCully, Texas A&M; Fred Weick, Piper Aircraft Corp.; and Dr. Aaron Rose, Texas Engineering Ex-

periment Station. **Right** (left to right): W. A. Lewis; James T. Pyle, deputy administrator of the FAA; Jay A. McCausland, FAA agricultural specialist; and Dr. Wayne G. McCully.

Responsibilities Told At Texas Meeting

ONE of the quickest ways to discourage a manufacturer from working in the field of agricultural chemicals is to involve him in several lawsuits resulting from careless chemical application, Dr. J. H. Davidson, Dow Chemical Co., Midland, Mich., told the conferees at the ninth annual Texas Agricultural Aviation Conference and Pest Control Short Course, Feb. 22 to 23 at Texas A. and M. College.

Dr. Davidson said that most manufacturers spend considerable time and money in developing suitable formulations and training men to advise aerial applicators about the products they offer. It is to the mutual advantage of the manufacturer and aerial applicator if they co-operate closely, he said. Carelessly applied agricultural chemicals not only cause dissatisfied customers, Dr. Davidson continued, but also may result in lawsuits against the applicator and the manufacturer of the product that has been applied.

Trouble sometimes arises, he said, when insecticides or certain herbicides are improperly used or applied in adverse weather conditions. The dust or spray can drift onto a neighbor's place and damage crops, livestock, or wildlife.

Careless Applications Can Result In Suits Against Both Applicator and Manufacturer

The session is held each year for aerial applicators of seed, fertilizer, pesticides and herbicides. Dr. Wayne McCully, associate professor in the A. and M. Range and Forestry Department, was conference chairman.

James T. Pyle, deputy administrator of the Federal Aviation Agency in Washington, D. C., said that proposed regulations under the Federal Aviation Act of 1958 will apply to aerial applicators of farm chemicals.

He said an extensive study has been made and the rules would allow aerial applicators maximum freedom of operation consistent with the FAA's obligation to the public to protect persons and property on the ground.

The proposal is based on the belief that the best approach to the problem is to do away with the present waiver of regulations and issue qualified aerial applicator operators air agency certificates, Mr. Pyle said.

Two major controls are in the regulation, the speaker said. They

are increased pilot competence and a clear-cut line of responsibility for conduct of the operation. He said lack of proper pilot training is one of the main causes of hazards to persons and property on the ground. The new air agency certificate would place the responsibility for training the pilot on the applicator operator, with the training under supervision of the FAA.

The second phase of the proposed regulation is that responsibility would ultimately rest with the holder of the air agency certificate. A large operator would be expected to delegate such responsibility throughout his organization, Mr. Pyle said.

"I am sure that it will be possible in the writing of the proposed regulation to provide wide flexibility. The regulation will be proposed in general terms with details left to the operator but subject to the approval of FAA. Certificates would be issued with ratings, just as is the case in approved flying schools," he said.

Louis A. Liljedahl, engineer with the U. S. Department of Agriculture at Beltsville, Md., described three new developments in pesticide application equipment which should affect future aerial application research.

First is a recently developed technique for estimating the average drop diameter by measuring the diameter of the largest drops in a particular spray. Another development, he said, is the fact that high speed digital computers in medium and small sizes are becoming increasingly available to agricultural research workers. These computers will undoubtedly speed up a number of research studies and make others possible which scientists would not have previously attempted, Mr. Liljedahl said.

A third research project is the use of fluorescent chemicals for quantitative and qualitative measurement of spray distribution. Mr. Liljedahl said use of fluorescent chemicals makes possible fast measurements of the distribution of spray across a swath without becoming involved in a lot of chemical measurements.

Don Springer of Washington, D. C., agricultural meteorologist with the U. S. Weather Bureau, outlined a trial project in farm weather service in Mississippi's Delta area.

He said the project provides specialized farm weather forecasts three times daily, advisory service which interprets weather conditions in relation to farming, distribution of farm weather information via teletypewriter circuit and weather observations for forecasting and farm research.

Looking to the future, Texas Agricultural Extension Service Economist John G. McHaney predicted for 1960 a slight drop in average prices to farmers, a slight rise in production cost and another drop in total realized net farm income.

For cotton, he said there probably will be national average crops of about 15 million bales because

the law says the minimum upland cotton allotment is 16.3 million acres. During the current 1959-60 marketing season, exports will about double what they were last year, but there is no indication the trend will continue next year.

Feed grains, he said, are expected to average a little lower in price this season compared to last season. The price decline likely will affect mostly corn and grain sorghum.

Mr. McHaney said the rice carryover on Aug. 1, 1959 was less than half of the record carryover of only three years earlier, a favorable situation from the price standpoint.

Reduction in carryover stocks during the past three years reflects acreage controls and the acreage reserve program, as well as the high level of exports, Mr. McHaney said.

(Continued on Page 118)

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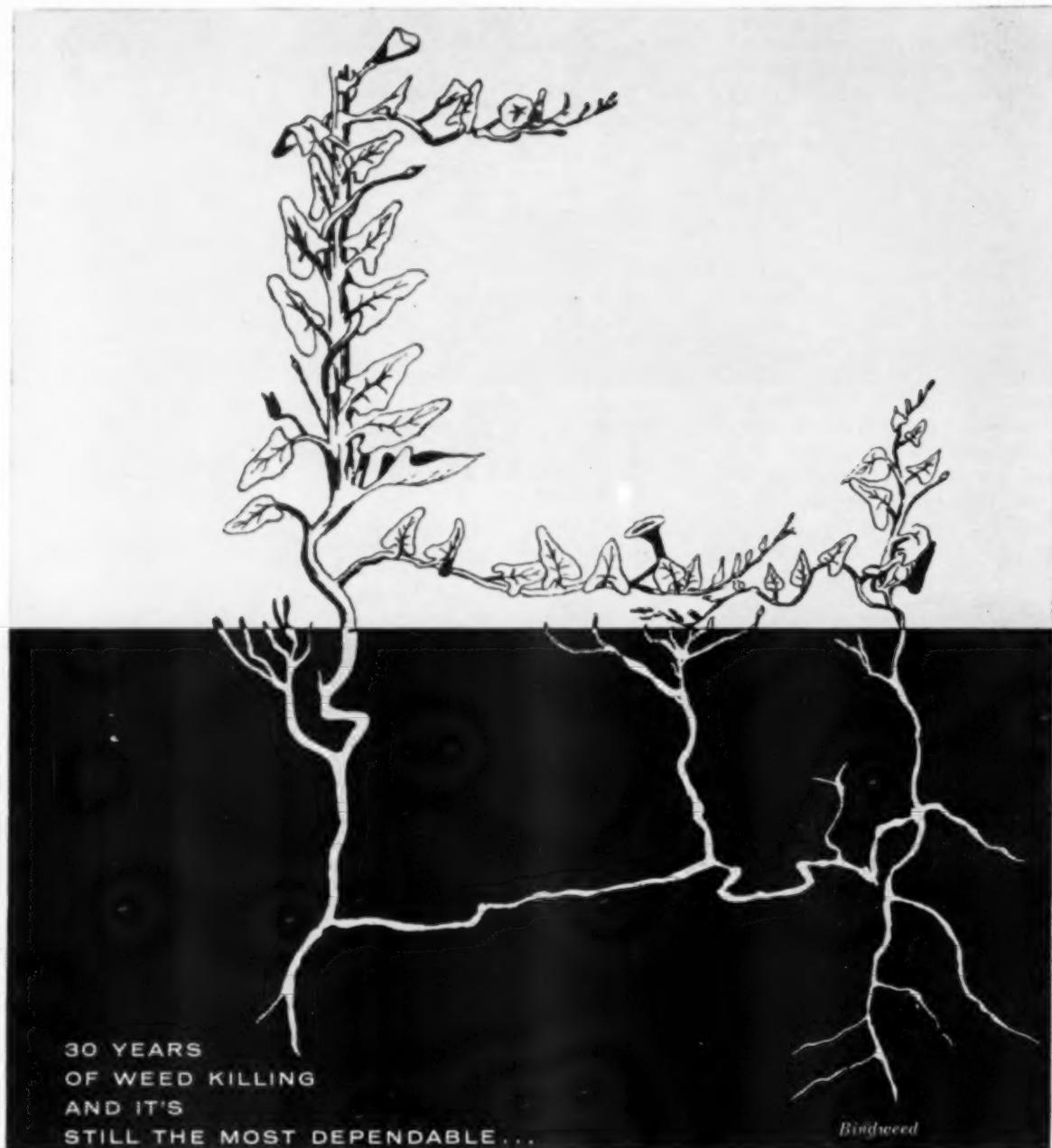
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Mississippi Applicators Plan More Services To Farmers

by Catherine Campbell

The Daily Herald
Biloxi, Miss.

SUGGESTED methods for expanding the services of aerial applicators among planters, principally the cotton farmers of the Mississippi Delta, received prime consideration during the annual Mississippi Aerial Applicators Conference, Feb. 12-13, at Biloxi, Miss.

This concern with establishing a greater and more constant outlet for the services of flying agricultural sprayers and dusters as a means of stabilizing their businesses and putting them on a firmer footing was said to be an indication that the field is "coming of age." New opportunities for applicators were cited by one speaker and another noted that the irresponsible "fly-by-night" operators of old are being weeded out or are turning into responsible businessmen.

Dr. Marvin Merkle, U.S. Department of Agriculture entomologist, Leland, speaking to a conference luncheon, stated, "The future of the field is limited only by the

people in the industry." The aerial applicator today must know much more than just how to fly a plane, Dr. Merkle stated. He must have the technical knowledge of the chemicals he uses and know how and when to apply them.

K. P. Ewing, Washington, D.C., retired U.S.D.A. entomologist who is now a consultant for Hercules Powder Co., suggested a closer look at offering services other than cotton insect control and applying defoliants. In addition to these, said Ewing, applicators could increase their business through the application of more fertilizers and herbicides.

Among the problems of the industry in Mississippi, where its major customers are the cotton planters in the Delta, is the seasonal aspect of the business. Demand is so great when rainfall is heavy and insects plentiful that operators must maintain more equipment for these peak times than they normally need.



Dave Harris (right) presents certificate of honorary membership in association to Dr. August Raspet.

Dr. Merkle suggested the study of three R's to benefit the applicators. They are: the resistance of insects to insecticides, the residues left in plant life by certain chemicals and the relations of the industry with the public.

Cy Emery, Laurel, operator of Magnolia Aviation Co., was re-elected to serve his third term as president of the conference. Other officers named at the session were Mabry Anderson, Clarksdale, vice president; and Jack Shannon, Clarksdale, re-elected secretary-treasurer. Ed Osborne of Tunica and Johnny Easter of Hollandale were named to three-year terms as directors, along with Edgar Hobbs, Moorhead, who will fill the unexpired term (one year) of the new vice president. Ben Willis of Moorhead was elected pilot director.

Honored by the conference was Dr. August W. Raspet, head of the aerophysics department of the Mississippi State University. He was made an honorary member of the group.

As the result of some 11 years of basic research by his department at the university, said Dr. Raspet, a unique small observation plane will be delivered to the U.S. Army in the next year and a half. Some features of the plane, its ability to land and take off at low speeds and its efficiency, make it peculiarly adaptable to crop spraying and dusting.

Dr. Raspet said the research plane has caused "quite a stir" in
(Continued on Page 107)



Officers of the Mississippi Aerial Applicators Association shown at the meeting are (left to right): Johnny Easter, director; Ed Osborne, director; Jack Shannon, secretary-treasurer; Cy Emery, president; Mabry Anderson, vice president; Dave Harris, director; Edgar Hobbs, director; and Ben Willis, pilot director.



Group discussing plans and program of the Louisiana Aerial Applicators conference. Standing (left to right): Woody Dry, A. B. Leonard, Merle Gustafson

and Kirby L. Cockerham. Seated (left to right): Emery Lyons, Mrs. Rita Garon and W. A. Rose. The meeting was held January 21 on the LSU campus.

Airplanes In Forestry Among Louisiana Topics

by Kirby L. Cockerham

Specialist (Entomology)

Louisiana State University

APPROXIMATELY 100 agricultural pilots and representatives of aircraft companies met in Seaman A. Knapp Hall, on the Louisiana State University campus on January 21 and 22 for the fifth annual conference of the Louisiana Aerial Applicators' Association. W. A. Rose of Lake Charles and A. B. Leonard of Jennings served as president and secretary, respectively, of the association. Kirby L. Cockerham, Extension Entomologist, Louisiana Agricultural Extension Service, was general chairman, and Woody Dry, Assistant Extension Entomologist, was in charge of local arrangements.

The first part of the program was devoted to bringing the pilots up-to-date on the insecticide recommendations. The 1960 recommendations on cotton, rice, sugarcane, pastures and forage crops, and forestry were discussed by J. S. Roussel, Lewis Hill, L. D. Newsom, Henry Long, Dan F. Clower of

the Louisiana Agricultural Experiment Station, Minus Granger, County Agent, and R. N. Dopsom of the U.S. Department of Agriculture.

Featured speakers of the program included Dr. August Raspet, Aeronautical Engineer from the Mississippi Experiment Station; General T. B. Herndon, Chief, Aeronautics Division, Louisiana Department of Public Works; and Roe E. Duggan of the U.S. Food and Drug Administration.

Dr. Raspet gave an illustrated lecture on the technical aspects of agricultural plane design and equipment. He discussed the relation of speed to downstream, stall speed and cruising speed, and improved landing gear. A movie film showed the comparison between different planes in speed, take-off, climb and landing. The value of these various features to the safety of the pilot was stressed. Dr. Raspet indicated that improved safety fea-

tures of planes result in lower insurance costs.

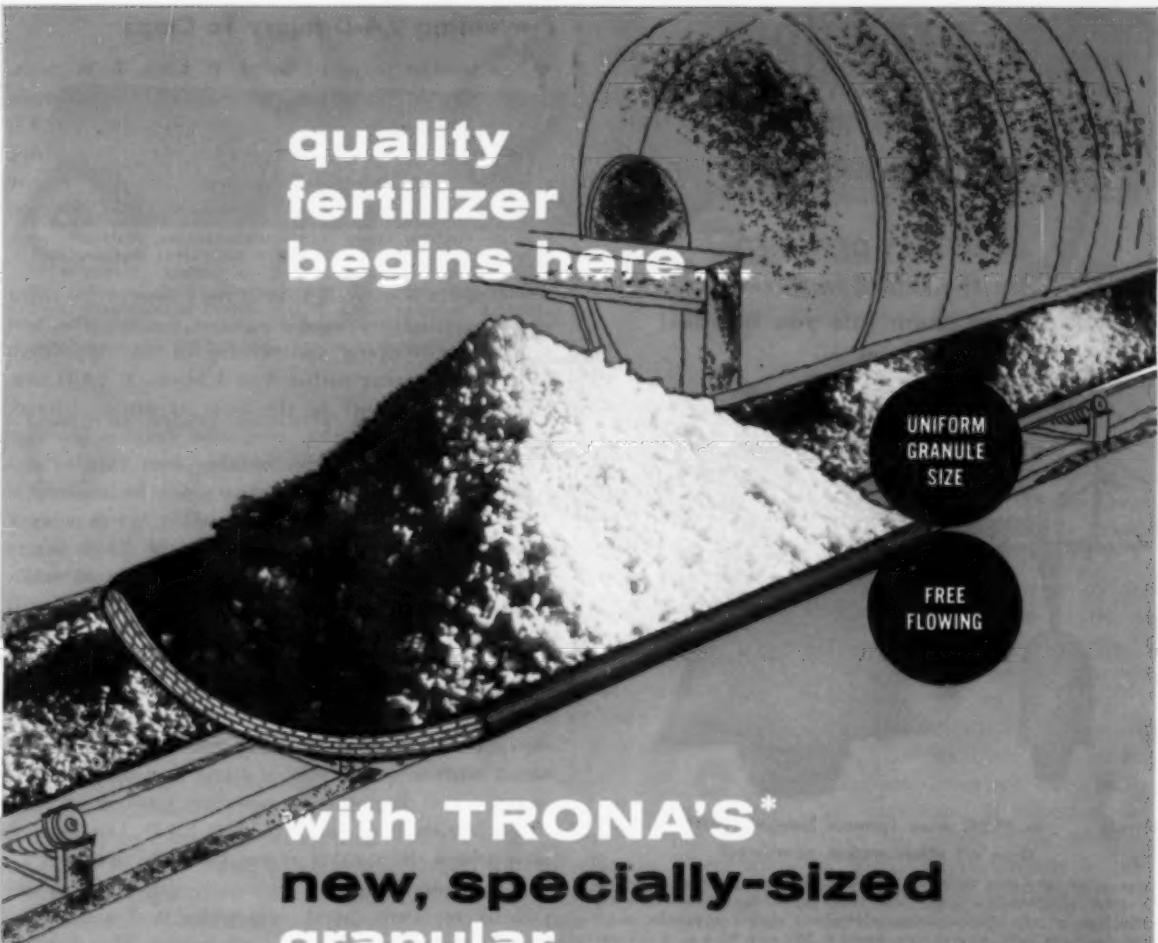
General Herndon discussed what aviation means to Louisiana and Mr. Duggan explained the federal regulations on pesticide residues on human and animal foods. He cautioned pilots about the careless use of pesticides and the necessity for following safe recommendations.

An interesting report also was given on the fire ant control campaign in Louisiana by E. A. Canienne, Louisiana State Department of Agriculture, L. D. Newsom, Experiment Station, and L. L. Glasgow, Professor of Forestry, Louisiana State University. Approximately 400,000 acres have been treated, of the 4 million acres infested. Effect of the insecticide on wildlife was a part of the discussion.

Development and usage of airplanes in forestry was the subject of a panel discussion by H. J. Derr and L. W. Orr, U.S. Forest Service, and A. S. McKean, extension forester, who was moderator of the panel. Mr. McKean reported 16,000,000 acres of forest land in Louisiana, one-half of which could benefit from plane service. He also discussed the value of plane calibration and flagging forests for best results. Mr. Derr discussed direct pine seeding from planes, and explained the necessity of treating pine seed with arasan to repel birds and endrin to protect against rats. Mr. Orr described the use of planes in spotting insect outbreaks, for which they presently are extensively used. In addition, planes are used effectively for spotting fires and for fire fighting. And he pointed out that they are effective for controlling leaf-eating insects but not for control of bark beetles.

Thomas Hansbrough of the L.S.U. Forestry School reported that planes can be used effectively in the control of brush and hardwood cover to promote rapid growth of young pines, and stated

(Continued on Page 107)



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Preventing 2,4-D Injury To Crops

IN a booklet prepared by M. B. Linn, F. W. Slife, and B. J. Butler of the University of Illinois, College of Agriculture, on the prevention of 2,4-D injury to crops and ornamental plants, it is pointed out that 2,4-D when carelessly applied, can injure such plants as tomatoes, snap beans, soybeans, melons, grapes, cotton, roses, chrysanthemums, redbud trees, and birch trees.

If 2,4-D is sprayed directly on a susceptible plant at a concentration used for weed control, the first symptoms, drooping and wilting of the uppermost leaves, may appear within 3 to 4 hours. If 2,4-D contacts the plant only in the form of an air-diluted, fine mist, or as a vapor, symptoms develop less rapidly and the initial effect on the plant may be less severe. Beginning symptoms may not be noticeable until they appear on new, expanding leaves a week or more after exposure. Symptoms of 2,4-D injury may continue to appear for a period of several weeks. After this period, normal leaves and shoots will develop.

The four types of exposure of plants are: direct spraying, mist, vapor, or through the soil. Exposure to direct spraying results when the spray operator, in spraying roadside or fence rows, overshoots the weeds with a sprayboom or hand gun and hits adjacent crops. Exposure to mist may result from practically all kinds of spraying with 2,4-D, but particularly where the sprayer is not correctly operated.

Exposure of plants to vapor may occur in the vicinity of lawns, parks, cemeteries, and other grass areas sprayed with high-volatile esters. The distance that vapor will travel and be injurious is not known with certainty since it is impossible to distinguish mist injury from vapor injury.

Exposure through the soil and subsequent absorption of 2,4-D through the roots may follow if excessive amounts of the chemical are sprayed on the soil close to trees and shrubs. Damage also may be caused by spraying the weed killer on slopes that permit it to be carried to the base of the plants by surface water.

To prevent this injury, applicators are cautioned not to use the high-volatile esters of 2,4-D and 2,4,5-T unless they thoroughly understand the dangers of using them and are willing to take the necessary precautions. Applicators also are cautioned not to use any form of the herbicide within one-half mile of sensitive crops, such as tomatoes and grapes.

In conclusion, the booklet points out that several new pre-emergence herbicides for use in corn-fields have been developed and tested and, although they are slightly more expensive than post-emergence sprays, their use should eliminate any hazard from drifting vapor or mist. Also, new, inverted-emulsion forms of 2,4-D and 2,4,5-T are available.

PEST ROUNDUP

This column, reviewing current insect control programs, is a regular feature of AGRICULTURAL CHEMICALS. Mr. Dorward is head—Survey & Detection Operations, Plant Pest Control Division, U. S. Department of Agriculture. His observations are based on latest reports from collaborators in U.S.D.A.'s pest surveys throughout the U.S.

By Kelvin Dorward



General Insect Activity Restricted

INSECT activity during February continued to be rather restricted. Aphids were active in several states with the greenbug on the increase and becoming more common in south central Oklahoma where counts ranged from 4 to 80 per linear foot, with the average being 23. In some areas of the state there was some decrease from previous weeks.

Greenbug populations were on the increase in Louisiana, particularly in the northwestern area. Counts ranged from 0 to more than 1,000 per linear foot of oats in fields in Claiborne, Ouachita, Red River and Natchitoches Parishes. Predators were not present in any of the fields surveyed, and the number of parasitized aphids was negligible. There was a slight increase of the greenbug in Arkansas. Counts ranged from 3 to 15, averaging 9 per linear foot in Washington and Benton Counties. In Texas, infestations were found only in isolated areas, and very little damage had been noted by the latter part of February. Greenbug counts in Kansas were very low. One wheat field surveyed in Marion County, Kansas, had less than one greenbug per square foot.

During February the pea aphid increased slightly on alfalfa in Yuma County, Arizona, with counts averaging 10 to 25 aphids per 10 sweeps. Light to moderately heavy populations were present in Chaves, Eddy and Lea Counties, New Mexico. Very light popula-

tions were showing on alfalfa in the El Centro area of Imperial County, California. The pea aphid, in light numbers, was found generally distributed in Oklahoma. The highest count recorded was 32 aphids per square foot of alfalfa crown area in a field in Choctaw County. In Kansas, counts averaged less than one aphid per square foot in a Marion County alfalfa field.

The spotted alfalfa aphid was light in all states reporting on the insect during February. There was a slight buildup in southern New Mexico counties, but by the end of the month this had been checked. California, Arizona, Texas, and Oklahoma reported the pest present, but only in limited areas.

The first report of the season for the alfalfa weevil in North Carolina was received the latter part of February. Larvae, some about half grown and averaging 2 to 3 per terminal, were reported from Richmond County.

Among the vegetable insects, the cabbage looper continued to be of concern on lettuce and cabbage in the lower Rio Grande Valley of Texas, with a considerable amount of control being applied, particularly in the Starr County area. In mid-March, heavy infestations of the vegetable weevil on turnips were reported from Wheeler County, Georgia. A thrips heavily infested seedling onions throughout most of the Mesilla Valley, New Mexico, and heavy populations of

the strawberry aphid were present on strawberries in El Cajon, San Diego County, California. A leaf roller also was heavy on strawberries in the same California area. At Downey, Los Angeles County, an aphid was severe on strawberries in a localized area.

The annual survey to determine the population of the beet leafhopper present in the far southern, desert-breeding areas was conducted during February. The insect is the carrier of the virus which causes curly top in sugar beets and tomatoes. Beet leafhopper movement is expected to be light this spring. This observation is based on conditions found in the survey, but weather conditions during March and April will have a definite effect on the amount of the leafhopper population that moves from the desert areas to cultivated districts. Movement of the leafhopper into the cultivated area of central and southern Arizona and southeastern California was expected to occur in late February or early March. The movement to southern Nevada and Utah is expected to take place during late March and early April and to central Utah and western Colorado during late April.

Bark beetles were causing complete kills of ponderosa pine in small groups on private lands in the Omo Ranch—Somerset—Fairplay area of El Dorado County, California. These beetles also were responsible for kill of small groups of ponderosa pine trees in the Placerville and Westfall—Miami, California areas. A reproduction

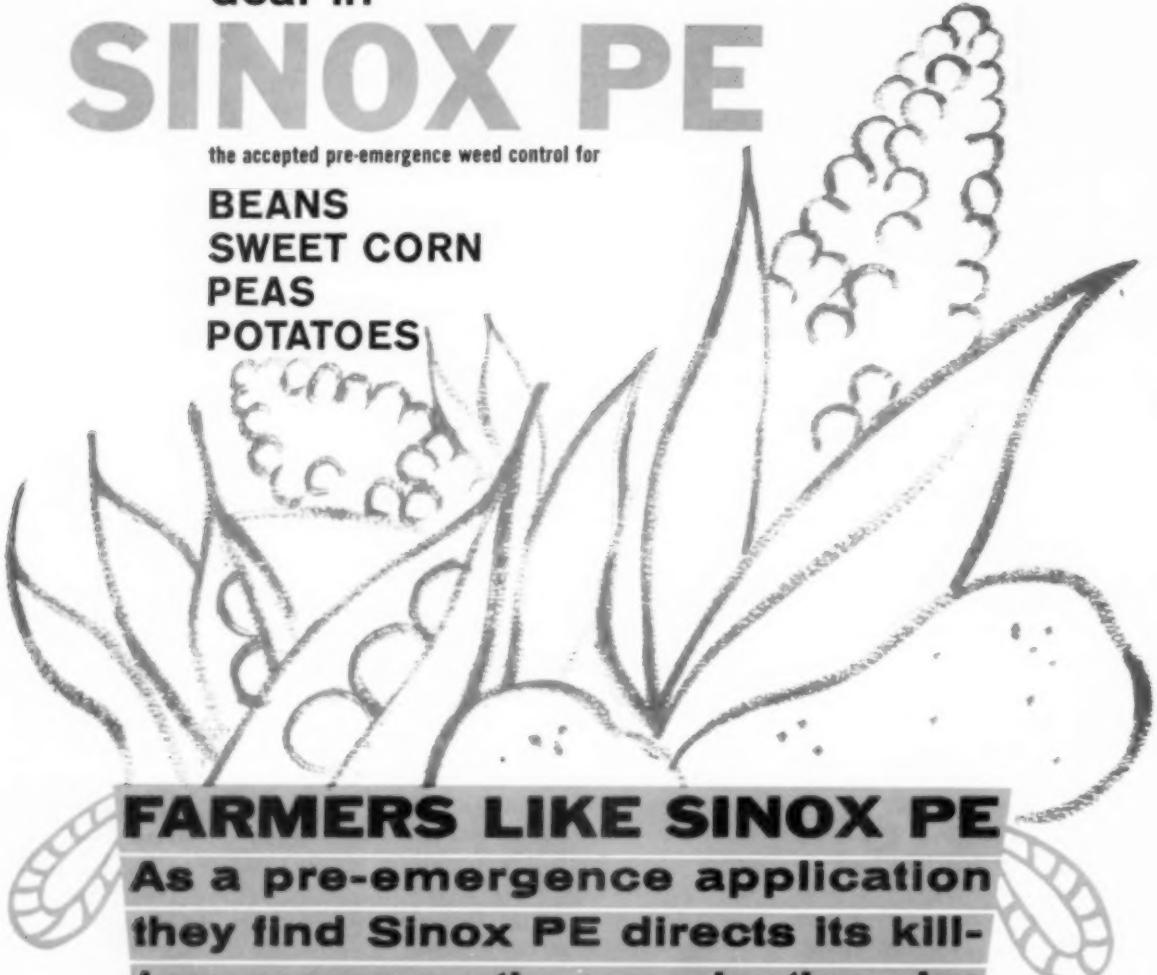
(Continued on Page 119)

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MARCH 22, SANTA BARBARA, CALIF.

APPREHENSION concerning adverse public opinion on agricultural chemicals, as a result of recent magazine articles and a book on the subject, was a recurring theme at the spring meeting of the Western Agricultural Chemicals Association.

Dr. Daniel G. Aldrich, Jr., who is Dean of Agriculture at the University of California, told the more than 200 members and guests that the problem of pesticide residues in agricultural commodities is one of the most serious that agriculture has faced in a long time. Pesticide residues are the responsibility of the chemical producer and formulator, research and extension workers, pesticide salesmen, applicators and farmers. Specifically, the immediate concern is over contamination of agricultural commodities by chlorinated hydrocarbons for which present Food and Drug regulations permit no residue tolerances whatsoever, Dr. Aldrich said.

"There is a crying need for properly documented, scientifically tested information on the real effects of small amounts of agricultural chemicals on human health. The preponderance of toxicological information used today has been developed with small laboratory animals, and the effects upon humans deduced from these experiments. Zero residue tolerances presently established should be re-examined in the light of cold scientific fact. Fable or fancy should not be, and must not be the basis for determining the use of chemicals in agriculture.

"Our primary problem today results from a law which prohibits certain agricultural commodities from commerce if they contain, analytically, detectable amounts of certain chemicals. This regulation needs re-examination since the amount of a chemical found in a substance is dependent upon the sensitivity of the analytical method used. Furthermore, there is no evidence whatsoever that the amounts detected in these com-

Report of W.A.C.A. Meeting

Continued Increase in Pesticide Sales Predicted...Despite Factors Threatening Growth of Market

modities are in any way injurious to human health. The evidence accumulated from nearly 15 years of use indicates that they are not. It is my sincere hope that the present law governing the use of chemicals in agriculture can be amended in accord with scientific facts."

Prefacing his remarks with the thought that farming has changed from a way of life to a way of making a living, William R. Dixon, Dow Chemical Company, told members of W.A.C.A. that the greatest change occurring in their business has been in the area of distribution and marketing.

"The fundamental point, it seems to me, is that a basic manufacturer must undertake responsibility for the efficiency of the distribution channels he elects to use. Otherwise, someone else will properly appraise the situation, and select the most efficient means for distribution. Through his enterprise, this innovator would ultimately gain control of the use of the product and the right to dictate to the basic manufacturer or the formulator, how he is to market his goods. We have all seen this happen."

Mr. Dixon listed two critical problems looming on the horizon when appraising the means currently used to achieve distribution of agricultural chemicals. The first is to properly serve the changing and expanding demand for agricultural products. Basic manufacturers, formulators, distributors and farmers must be assured of a continuing supply of improved and new products. These products can come only from programs of research that are thorough, painstaking and expensive. The long years of invention, testing and reg-

istration are undertaken by the manufacturer on the assumption that he will be able to offer a safe, attractive product that will improve farm operations, at a price that will allow him to recoup his research investment, and show a profit for his labors.

The second critical point is that reading and following of directions for handling pesticides could have eliminated many headaches in the past and is a subject of great concern in the future.

"We all recognize that many of our products present a real threat to public safety when used improperly. The proper discharge of our responsibility in this aspect of our work hence becomes a very real moral issue. Our associations have conducted vigorous campaigns on the importance of reading the label, and following its instructions. Label directions on the containers in which our products are shipped really tell quite a story. This story is a very concise summary of the millions of dollars worth of research, field testing and registration that I mentioned a little earlier. It is not fancy advertising copy, penned idly by a package designer. The label on an agricultural chemical package is quite a bit more significant than its counterpart on other types of products. Its importance lies in its guarantee of full compliance with the various regulations that govern our business. These regulations have been created to safeguard the health of the public, and we are morally responsible for their observance."

S. H. McAllister, Shell Chemical Corp., presented a detailed analysis of a number of factors which could limit the expansion of

the agricultural chemicals industry. Reviewing where the industry stands at the moment, Mr. McAllister said:

"The size of the U. S. pesticide market in 1959, in terms of value at the manufacturer level of basic toxicants produced for sale, is approximately \$278 million.

"The total business including basic toxicants, carriers, diluents and markups has been "guesstimated" at \$500-\$600 million. Over the past ten years, the growth of the pesticide industry has averaged about 10% per year at the manufacturer's level and it should continue to grow but probably at a slower rate."

The afternoon session was devoted to a panel discussion on "Marketing Aspects of the Agricultural Chemicals Business". Dr. G. F. MacLeod, Niagara Chemical Division, Food Machinery and Chemical Corporation, Fresno, California was panel moderator. Opening the discussion, C. E. Cody, Regional Manager, California Spray-Chemical Corporation, spoke on "Marketing Trends in the Western States".

According to Mr. Cody, the most outstanding trend in this industry is that for the past several years, all business costs have increased percentage-wise faster than prices, sales volume and profits; and industry, itself, has not had the fortitude and flexibility to do anything about it.

"The rate of growth for the pesticide industry has been excellent. In 1939 pesticide sales were a conservative 40 million dollars and by 1954 they shot up to 260 million. The pesticide market for 1975 has been forecast at 1 billion dollars, or 248 per cent over the 1959 potential. This rate of growth is approximately twice the growth rate of plant foods for the same period of time.

"Some of you, specifically firms selling their products through resellers and direct to the grower, might be surprised if you checked the number of customer accounts on your books at the end of 1959

and made a comparison with the same figure for 1954. Even though your sales show a normal gain for this period, it is very likely that you sold fewer accounts in 1959 than you did in 1954.

"At the present time, there are 18 per cent less farms in the nation than at the end of World War II. These figures are indicative of a trend to larger but fewer customers, which of course means increased competition between our growing field marketing organizations and also, in some cases, greater credit exposure and risk.

"Marketing patterns and distribution trends are also changing and most areas of the western states are now operating on a two-price pattern, reseller and consumer. With the exception of one or two areas in the Northwest, there isn't any classification such as distributor. Supposedly, a true distributor sells 85 per cent or more of his merchandise through resellers and I doubt if there are any distributors in the western states that can meet this qualification.

"The number of pesticide products and package sizes required from a manufacturer and formulator has been increasing each year. In 1948 in California there were 8,000 products registered; in 1958, 14,000 and of course this trend contributes greatly to increased money invested in inventory, containers, labels, registrations and raw materials.

"In 1948 there were less than a million acres treated by aircraft in the state of California and these applications were primarily of dust products. In 1958 in California, aircraft treated 5,300,000 acres, with a significant increase in use of liquid products over dusts.

"Of all pesticide applications made in 1958 by registered State of California applicators, 57.6 per cent consisted of aircraft applications of liquid products, 23.1 per cent of dust applied by air, and 19.3 per cent of dusts and liquids applied by ground equipment. These figures indicate a rapidly

growing trend toward liquid products over dust and, in all probability, future products containing a higher concentration of active ingredient per gallon of product."

Branch Entomologists Meet

By J. J. Davis

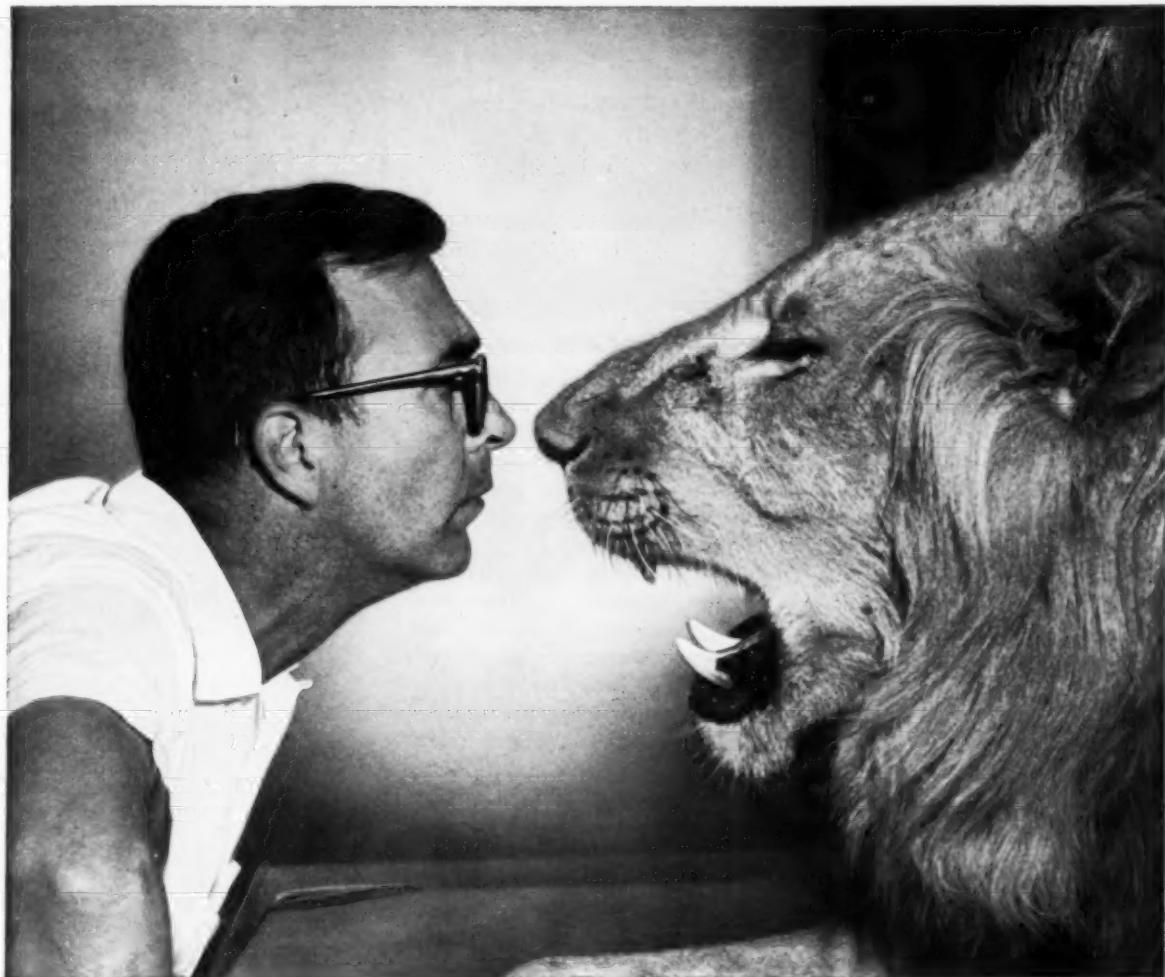
THE 15th annual conference of the North Central Branch, Entomological Society of America, held at the Schroeder Hotel, Milwaukee, March 23 to 25, was attended by 350 members, a record turnout.

M. P. Jones, president of the Entomological Society of America, opened the meeting with a talk which emphasized the importance of entomologists' contribution to public welfare. John V. Osmun, head of the entomology department, Purdue University, presented his observations on Russia, with special reference to the entomological work in that country. Dr. Osmun was a member of the entomological group, sponsored by the Entomological Research Branch, USDA, which spent a month in Russia last summer.

The program included 98 papers presented by 127 individuals. The main emphasis seemed to be the many new chemicals recommended as insecticides, survey methods, effects of pesticides on wildlife, and the problems involved in chemical residues.

In concluding a pesticide-wildlife discussion, Dr. G. C. Decker, Illinois Natural History Survey, Urbana, said that it is not the use of insecticides but their misuse that is harmful to wildlife. It was emphasized in the discussion that there is no evidence of any danger to humans by proper use of pesticides and food additives in food production.

J. W. Apple, U. of Wisconsin, 1959 Branch Chairman, presided over the meeting. D. M. DeLong, Ohio State, was named chairman for 1960 and L. K. Cutkomp, U. of Minnesota, was elected chairman-elect for 1961. The Branch announced that its 1961 meeting will be held at Kansas City, Mar. 22-24.



Why you should take a close look at LION E-2*

You don't have to look this close to see the advantages of selling Lion E-2 Ammonium Nitrate. The first thing you'll notice is that Lion gives you a definite storage advantage because of its super-density. An 80-lb. bag of Lion E-2 is 20 to 25% smaller than an 80-lb. bag of any other brand. Thus, the storage space you save with Lion E-2 can be used for 20 to 25% larger inventories to make more profit.

You feel the second advantage when you pick up a bag of Lion E-2. The bags are coated with Syton®, a special Monsanto antislip agent that lets you and your customers get a better grip for faster, safer handling.

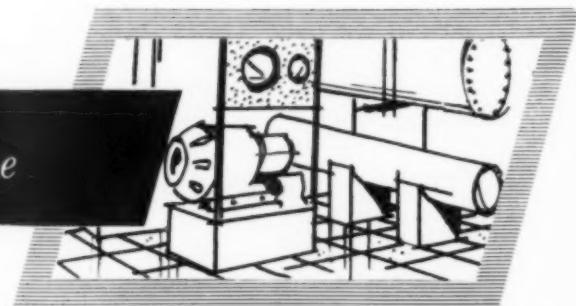
Lion E-2 gives your customers another big advantage, too. Because Lion E-2 is super-dense, farmers can load more in their spreaders... actually eliminate one out of every five refill stops! And, Lion E-2 is guaranteed at least 33.5% vital nitrogen for maximum yields.

If you want the "lion's share" of ammonium nitrate sales in your area, take a close look at Lion E-2. You'll like what you see! Want more information? Just roar! LION E-2, Monsanto Chemical Company, St. Louis 66, Mo. LION, Reg. T. M., *E-2: T. M. Monsanto Chemical Co.



LION E-2 is the only ammonium nitrate on the market that can save 20 to 25% of your valuable storage space. Because each Lion E-2 prill contains less useless air, you can stack *five* 80-lb. bags of Lion E-2 in the same space previously taken up by just *four* 80-lb. bags of any other brand. (Lion E-2 is a good deal for your customers, too. Because of E-2's super-density, farmers can eliminate one out of every five refill stops.)

Production Roundtable



Fluorine Recovery From Superphosphate Den Gases

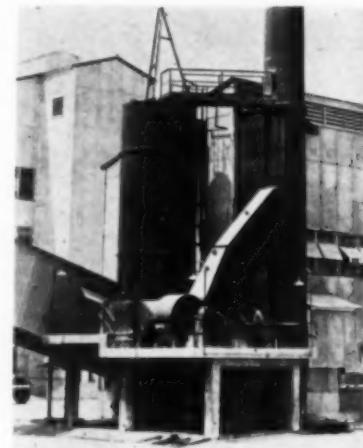
FUME and dust control in a fertilizer plant is more than a nuisance abatement measure. Economic studies have shown considerable savings through dust recovery, not only in the value of the material recovered, but also in savings resulting from good housekeeping, i.e., reduced cost of cleanup on stairways and floors, less damage from dust settling and damaging compressor cylinders, truck and vehicle engines, etc.

James A. Gross, engineer for Chemical Construction Corp., New York, suggests that recovery of fluorine as a saleable by product is a source of income overlooked by a number of fertilizer producers.

Phosphate rock, which contains 6-10% calcium fluoride, forms hydrogen fluoride gas during acidulation and this, in turn,

combines with silicon dioxide to form the fluorine gas Si F_4 . Mr. Gross reports that an S-F Venturi Scrubbing system can be effectively used to recover the fluorine as H_2SiF_6 . One suggested arrangement of the equipment for this purpose is shown below. The S-F Venturi Scrubber has been especially designed to provide high scrubbing efficiency combined with trouble-free operation when recycling a heavy slurry, such as would be encountered in fluorine recovery units. Recent pilot tests indicate that, depending upon the amount of fluorine present in the inlet gases, removal efficiencies of 90-98% can be obtained while scrubbing with a 15% H_2SiF_6 slurry.

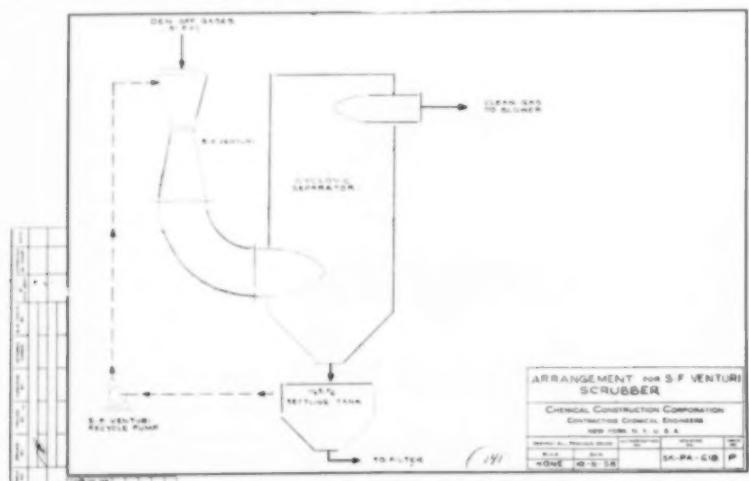
The S-F Venturi can also be used to recover other valuable products as evidenced by one recent installation whereby the client recovers ammonia leaving a fertilizer process, by scrubbing with phosphoric acid to form ammonium phosphate.



P-A Cyclonic Scrubber

The cost of an S-F Venturi Scrubbing system designed to recover fluorine compounds, would, of course, depend on the materials of construction selected and the volume of gas to be handled. For the same set of conditions, however, the cost of an S-F Venturi Scrubbing-Recovery system would be approximately the same as that for other gas cleaning equipment designed to remove fluorine for abatement purposes only.

In areas or for processes where recovery of the fluorine compound is not economical or feasible, the P-A Cyclonic Scrubber, also marketed by Chemical Construction Corporation, has been proven extremely efficient in removing fluorine for abatement purposes. Some eight P-A Cyclonic Scrubbers are presently in commercial use on den off-gases, and comply with local air pollution ordinances. The photo above shows one such installation. The equipment in this particular case is of neoprene lined mild steel construction.★



Arcadian® News

Volume 5

For Manufacturers of Mixed Fertilizers

Number 4

Sell More Tonnage NOW Sell ARCADIAN® Nitrogen

The rush season for mixed fertilizer sales will soon be over. But, there is still time to extend your season and sell more tonnage. Now is the time to aggressively sell ARCADIAN nitrogen materials (liquid and dry) for top-dressing and side-dressing.

Demand is Increasing

The market is there! Thousands of farmers in your sales territory will buy nitrogen for supplemental application this spring and summer. It will pay you to make sure that your mixed fertilizer customers buy their straight nitrogen from you. You can't help but benefit when your customers make you their headquarters for all their fertilizer needs.

You strengthen customer loyalty and you get a bigger share of the fertilizer market, when you supply all of the mixed goods analyses and straight materials your customers need and want. It pays to establish your prestige and your leadership as a dependable, one-stop, full-line source of supply.

You Benefit 5 Ways

Here are some of the benefits you get when you sell ARCADIAN nitrogen: 1) You increase your total sales and profits. 2) You help farmers to get better yields and insure that response to your mixed fertilizers will not be limited by lack of nitrogen. 3) You spread your overhead expense over a larger tonnage.

- 4) You keep your sales staff busy over a longer period.
- 5) You build farmers into exclusive customers for you and your dealers.

Nitrogen Division, Allied Chemical, manufactures and sells nitrogen for use in making mixed fertilizers and for direct application. Nitrogen Division has always fostered the role of nitrogen in a balanced fertilizer program and has spent millions of dollars to promote the use of mixed fertilizers. Nitrogen Division has also established ARCADIAN Nitrogen Products as the leading source of supplementary nitrogen for direct application.

Let Nitrogen Division Help You!

It will pay you to let Nitrogen Division work with you in helping you to offer your customers a complete line of mixed fertilizers and straight nitrogen materials. Many different ARCADIAN Nitrogen Solutions are available for the manufacture of every mixed fertilizer analysis now in demand. Many different ARCADIAN Nitrogen Products are also available to sell to farmers for direct application.

These products are powerfully promoted with the biggest nitrogen advertising campaign in history. For information about this campaign, see the following two pages. It will pay you to cash in on this campaign now! Extend your season and handle more tonnage, by selling ARCADIAN Nitrogen Products!



MORE RADIO

The ARCADIAN radio advertising campaign has been increased this year. More radio stations have been added and more time is being used on all stations.

MORE TV

Television stations in many farming areas are selling ARCADIAN with regular broadcasts which reach the farmer by eye and by ear several times each week. TV advertising gives extra impetus to sales.

BILLBOARDS

Large billboards, placed along well-traveled roads and highways in intensive fertilizer-consuming areas, display colorful posters during the fertilizer season, constantly reminding farmers of the profitable advantages of ARCADIAN Nitrogen Products.



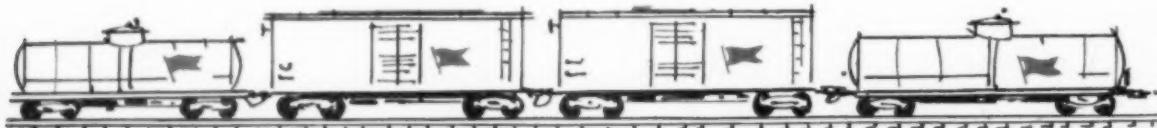
BIG, NEW PROFITS FAST-MOVING

Here's **powerful advertising** support for you—a big, expanded campaign to sell complete fertilizers and ARCADIAN® Nitrogen Products! Nitrogen Division, Allied Chemical is going all out this year to carry the ARCADIAN message to millions of farmers. All types of media that reach and influence farmers are being utilized—farm magazines, state farm papers, TV, radio, billboards, literature, exhibits, etc.

Much of this big, powerful campaign sells farmers on

the importance of complete, balanced fertilizers. Most of the campaign is devoted to helping you sell modern, labor-saving, profit-building ARCADIAN Nitrogen materials—liquid and dry. More farmers are getting more education and more real sell this year than ever before.

It will pay you to take full advantage of this campaign by stocking and featuring ARCADIAN products. It can mean more traffic through your dealers' stores—more tonnage and more profits for you.



FARM MAGAZINES

During the fertilizer season, large, colorful ARCADIAN advertisements appear in every issue of many leading farm magazines. These magazines reach millions of farmers, blanketing your market with powerful sales-producing promotion of ARCADIAN Products.





FOR YOU ON THE Arcadian® LINE!

The **ARCADIAN** trade-mark is as familiar as the face of an old and trusted friend to everybody who buys and uses fertilizers. It is the well-known symbol for high-quality, nitrogen products. The biggest and most powerful advertising campaign in nitrogen history is pre-selling millions of farmers, making it easier for you and your dealers to get orders. All this advertising effort is working for you, helping you move more tonnage, if you stock and sell **ARCADIAN**!

AMMONIUM NITRATE

A-N-L® NITROGEN

**Golden URAN®, NITRANA® and
FERAN® Nitrogen Solutions**

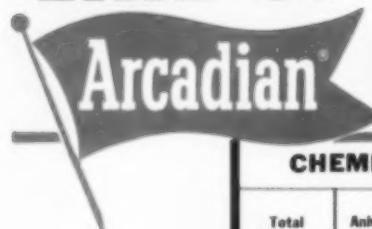
ANHYDROUS AMMONIA

AMERICAN NITRATE OF SODA

UREA 45



HERE'S THE BIG LINE OF



When you purchase your nitrogen requirements from Nitrogen Division, Allied Chemical, you have many different nitrogen solutions from which to select those best suited to your ammoniation methods and equipment. You are served by America's leading producer of the most complete line of nitrogen products on the market. You get formulation assistance and technical help on manufacturing problems from the Nitrogen Division technical service staff. You benefit from millions of tons of nitrogen experience and the enterprising research that originated and developed nitrogen solutions.

NITROGEN SOLUTIONS

	CHEMICAL COMPOSITION %						PHYSICAL PROPERTIES		
	Total Nitrogen	Anhydrous Ammonia	Ammonium Nitrate	Urea	Water	Neutralizing Ammonia Per Unit of Total N (lbs.)	Apprx. Sp. Grav. at 60° F	Approx. Vap. Press. at 104° F per Sq. In. Gauge	Approx. Temp. at Which Salt Begins to Crystallize °F
NITRANA®									
2	41.0	22.2	65.0	—	12.8	10.8	1.137	10	21
2M	44.0	23.8	69.8	—	6.4	10.8	1.147	18	15
3	41.0	26.3	55.5	—	18.2	12.8	1.079	17	-25
3M	44.0	28.0	60.0	—	12.0	12.7	1.083	25	-36
3MC	47.0	29.7	64.5	—	5.8	12.6	1.089	34	-30
4	37.0	16.6	66.8	—	16.6	8.9	1.184	1	56
4M	41.0	19.0	72.5	—	8.5	9.2	1.194	7	61
6	49.0	34.0	60.0	—	6.0	13.9	1.050	48	-52
7	45.0	25.3	69.2	—	5.5	11.2	1.134	22	1
URANA®									
6C	43.0	20.0	68.0	6.0	6.0	9.3	1.180	12	39
6M	44.0	22.0	66.0	6.0	6.0	10.0	1.158	17	14
10	44.4	24.5	56.0	10.0	9.5	11.0	1.114	22	-15
11	41.0	19.0	58.0	11.0	12.0	9.2	1.162	10	7
12	44.4	26.0	50.0	12.0	12.0	11.7	1.087	25	-7
13	49.0	33.0	45.1	13.0	8.9	13.5	1.033	51	-17
15	44.0	28.0	40.0	15.0	17.0	12.7	1.052	29	1
U-A-S®									
A	45.4	36.8	—	32.5	30.7	16.2	0.932	57	16
B	45.3	30.6	—	43.1	26.3	13.5	0.978	48	46
Anhydrous Ammonia	82.2	99.9	—	—	—	24.3	0.618	211	-108

Other ARCADIAN® Products: URAN® and FERAN® Solutions • Ammonia Liquor • N-dure® A-N-L® • Ammonium Nitrate • UREA 45 • Nitrate of Soda • Sulphate of Ammonia

NITROGEN DIVISION

MAIN OFFICE: 40 RECTOR ST., NEW YORK 6, N.Y., PHONE HANOVER 2-7300



Hopewell, Va., P. O. Drawer 131
Ironton, Ohio, P. O. Box 98
Omaha 7, Neb., P. O. Box 166
Raleigh, N. C., 606 Capital Club Bldg.

Glenview 8-6301
Drexel 7-4366
Bellevue 1464
Temple 3-2801

Columbia 1, S. C., 1203 Gervais St.
Atlanta 3, Ga., 127 Peachtree St., N. E.
Memphis 9, Tenn., 1929-B South 3rd St.
Columbia, Mo., 1134 Highway 40W

Alpine 3-6676
Jackson 2-7805
Whitehall 8-2692
Gibson 2-4040

Indianapolis 20, Ind., 6060 College Ave. Clifford 5-5443
Kalamazoo, Mich., P. O. Box 869 Kalamazoo 5-8676
St. Paul 14, Minn., 764 Vandalia St. Midway 5-9141
San Francisco 4, Cal., 235 Montgomery St. Yukon 2-6840

LISTENING POST

By Paul Miller



This department, which reviews current plant disease and insect control problems, is a regular feature of AGRICULTURAL CHEMICALS. The comments are based on observations of collaborators of the Mycology and Plant Disease Reporting Section, Plant Protection Research Branch, USDA, Beltsville, Md.

Control of Black Scale and Aphids on Easter Lilies

EASTER lily growers desired to know whether the treatments for control of black scale of the bulbs, caused by the fungus *Colletotrichum lili*, and of the aphids that transmit the viruses producing necrotic fleck could be combined effectively; and whether it was desirable to use the treatment for black scale, as some growers were doing, when the disease was not present on the bulbs.

D. L. Gill (1) reported results of tests, designed to answer the questions, conducted by the United States Department of Agriculture, Agricultural Research Service, and the Georgia Agricultural Experiment Station. Black scale is controlled by soaking the diseased bulbs in a solution of Puratized Agricultural Spray and aphids are controlled by soaking in a solution of Demeton. In the test, these recommended treatments, used separately, were compared for safety and effectiveness with treatments in which the two materials were used together or in sequence. Demeton, in the combination treatments, did not affect black scale control by Puratized Agricultural Spray, nor did Puratized Agricultural Spray affect aphid control by Demeton.

All the treatments in which Puratized Agricultural Spray was used reduced the yield of bulbs; therefore the Puratized Agricultural Spray treatment for black scale should not be used unless the disease is present on the bulbs. Puratized Agricultural Spray followed by Demeton seemed to be the best of the combination bulb

soak treatments. However, when bulbs are to be treated with Puratized Agricultural Spray, it might be safer to apply Demeton to the plants as a spray, according to Gill (1).

Root Knot Control

Fertilizer-DBCP mixture has been tested for control of root knot on cantaloupes and tomatoes. In experiments conducted by the Maryland Agricultural Experiment Station, J. G. Kantzes, W. R. Jenkins, and R. A. Davis (3) obtained good protection of cantaloupes and tomatoes against damage from the root-knot nematode *Meloidogyne incognita acrita* by soil fumigation with a granular formulation of 1,2-dibromo-3-chloropropane (DBCP) premixed with fertilizer in proportions to supply the desired amounts of fertilizer and fumigant per acre. The trials were located on the Maryland Eastern Shore, in fields known to be heavily infested with the nematode. The soil was identified as Sassafras sandy loam. The DBCP-fertilizer was applied by conventional farm machines; thus the need for special fumigation equipment was eliminated. A tractor-pulled seed planter with fertilizer attachment was used for cantaloupes and tractor-mounted side-dressing equipment for tomatoes. For cantaloupes, application was made at time of planting the seed and for tomatoes 1 week after transplanting.

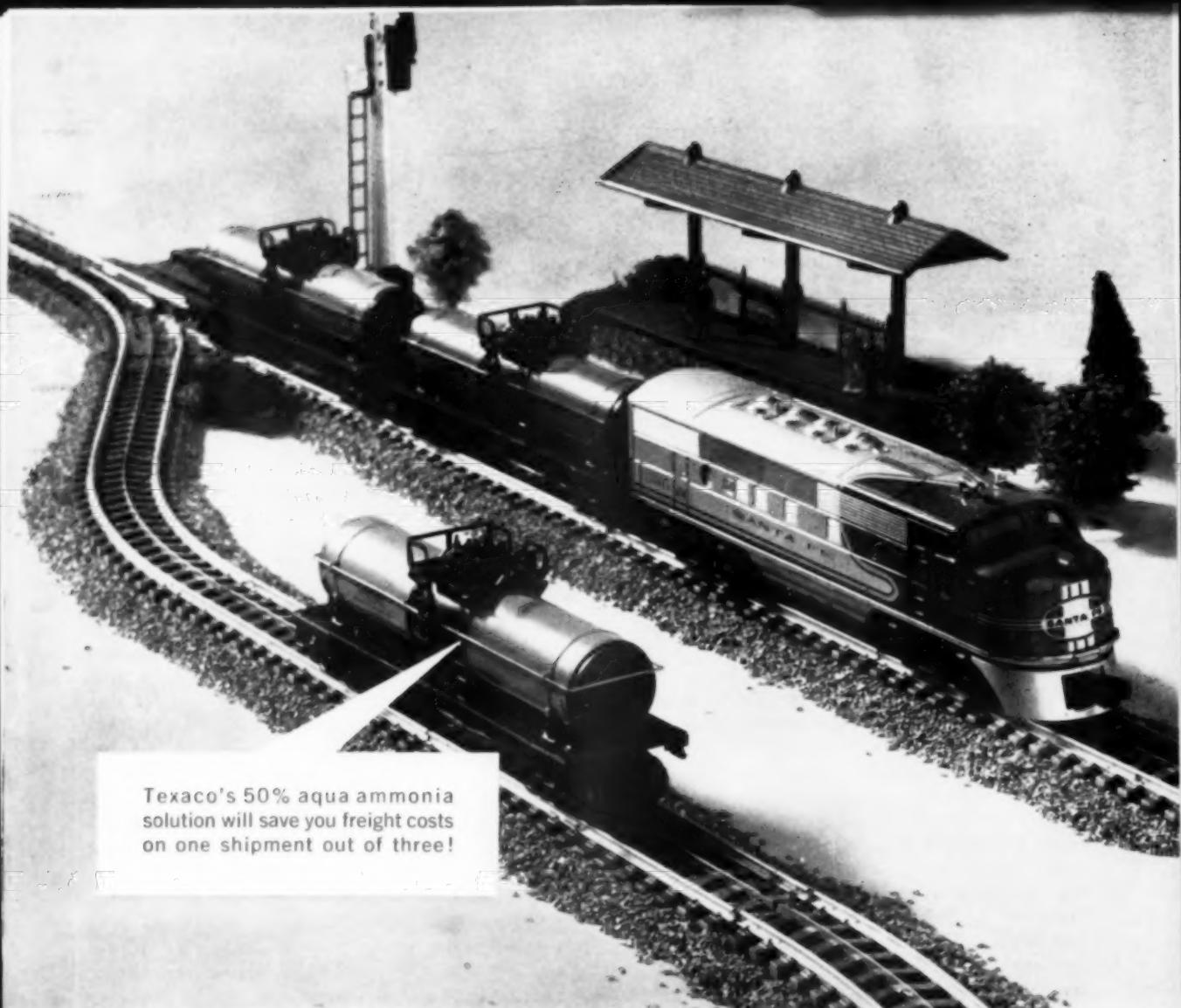
The treatment was effective in reducing root knot on both hosts. Neither crop showed evidence of

injury by the fumigant. Some conditions mentioned by Kantzes and his associates as possibly contributing to the effectiveness of the granular DBCP-fertilizer mixture in their tests include the physical nature of the soil of the test fields, and the relatively low volatility of the fumigant.

Amaryllis Leaf Spot

D. L. Gill (2) reported results of spray trials for the control of leaf spot, or red blotch, caused by *Stagonospora curtisii*, of amaryllis plants (*Amaryllis spp.*). The trials were conducted by the United States Department of Agriculture, Agricultural Research Service, and the Georgia Agricultural Experiment Station. Soaking the bulbs in solutions of various chemicals, the recommended control for leaf spot, is impractical in the South because of the cultural and marketing methods that also make the disease important to southern growers. All four spray materials tested reduced infection. Best results were obtained with Zineb and Ferbam. Captan and Copper A were less effective. Results indicated that in the South the amount of leaf spot on amaryllis could be reduced by spraying with Zineb or Ferbam, plus a sticker-spreader, beginning in the spring when the foliage is small and continuing at 10-day or 2-week intervals until blooming time. To prevent infection of the bulb scales, which frequently occurs, enough spray should be applied to run down into the bulb bases. Sanitation, rotation, and good air circulation in the plantings would

(Continued on Page 118)



Texaco's 50% aqua ammonia solution will save you freight costs on one shipment out of three!

Don't pay freight on water when you buy ammonia!

When you buy Texaco's new 50% aqua ammonia solution instead of the standard 29.4% solution you get the equivalent of free freight charges on one shipment out of three!

Texaco's new 50% NH_3 solution gives you 57% more ammonia than the same volume of regular 29.4% solution. You save shipping costs on one tank car out of three.

When 50% solution arrives at your plant, you can dilute it to 29.4% without additional investment in handling equipment.

Only Texaco offers you this saving! For more information on this ammonia solution or any other high-quality Texaco petrochemical, call or write Texaco Inc., Petrochemical Sales Division, 332 South Michigan

Avenue, Chicago, Ill., or 135 East 42nd Street, New York 17, New York.

Tune in: Texaco Huntley-Brinkley Report, Mon. Through Fri.-NBC-TV



TEXACO
PETROCHEMICALS

TEXACO PETROCHEMICALS: Aqua ammonia, anhydrous ammonia, nitrogen solutions, diisobutylene, odorless mineral spirits, naphthenic acid, propylene tetramer and rust inhibitors.

WASHINGTON REPORT

By Donald Lorch



A NUMBER of farm leaders in Washington think that it might be a good idea to conduct a public opinion sampling to discover exactly who was benefitted and who was hurt by last fall's cranberry scare.

It's becoming obvious here, that the affair has made a real impact on several state governments. Legislators in a number of states are proposing to set up panels of medical men and agricultural scientists to let the people know the truth about the subject.

As Governor Gaylord Nelson of Wisconsin indicates, many are just not satisfied with the lack of clear and consistent guidance from Washington, or with the harmful economic effect of some Washington statements "even for firms and individuals who may be completely innocent of any wrong-doing or negligence.

Significantly, the committee Gov. Nelson has set up to examine the question of chemicals in foods is headed by Dr. Conrad A. Elvehjem, president of the University of Wisconsin, and includes authorities from fields of medicine, cancer research, public health, and agricultural production.

Findings of the Wisconsin State committee and, presumably of other similar enterprises, will be channeled back to Washington through the State's representatives in Congress.

Something all agricultural chemicals makers might find worth taking a good look at is the program the National Plant Food In-

stitute has been running with bankers in some 30 states.

While the program has been going on for six or seven years, it has recently hit a new high in New York State. NPFI cooperated with the New York State Bankers Association and the New York State College of Agriculture at Cornell University in producing a 16-page booklet on "Farming For Profit."

Response to the booklet on the part of the bankers has been overwhelming. Following a run of 50,000 copies, the booklet is going back on the press for a second printing. In addition, New York bankers are putting out tape recordings for use on radio on the same subject.

The main theme of "Farming For Profit" is that the right amounts of fertilizer and lime will give farmers bigger yields for their investment of time and capital, and thus will give them higher net returns.

Significantly, the booklet underscores bankers' interest in the welfare and in the community, for when farmers prosper, the entire community prospers.

What makes this demonstration of an outstanding cooperative program for bankers important, in the eyes of many agri-business leaders here, is that capital demands in agriculture are rising. Bankers are playing a growing role in what is done by farmers.

Bankers admit that while the agricultural business banks are doing is going up, other business is going up even faster. The result, they say, is that the percentage of

agricultural credits in their overall business is getting smaller.

Men who know banking and agriculture assure us that this trend underscores the importance of working with bankers, of getting facts and figures to bankers so they will have a clear idea of the real economic importance of products used in agriculture.

We realize that much selling in the pesticide industry is on consignment, with the manufacturer assuming the credit obligations in many cases. A number of industry leaders have reported that this situation is not entirely satisfactory.

The remarkable success of NPFI in working with bankers so far as fertilizers are concerned does suggest that a similar program for pesticide makers might pay off in real dividends all around.

* * * * *

For all the publicity it gets, World Health Day, April 7, has failed to impress the general public with the fact that insecticides are a major hope for improving world health.

This year's World Health Day theme, for example is; "Malaria Eradication—A World Challenge." Hopes of medical men the world over for wiping out this *most costly* of all human diseases is the use of insecticides.

M. G. Candau, M. D., Director-General of WHO, points out that malaria right now is a constant threat to more than 1 billion human beings, that it strikes first at children, that it destroys the initiative and strength of adults.

(Continued on Page 103)



Adding up the values of IMC's

HERE'S WHAT IT

Over the last eighteen months IMC's *Total Service* has helped hundreds of fertilizer manufacturers sell more fertilizer profitably. It is called *Total Service* because it serves every phase of your fertilizer business. Reviewing this past year, here are the benefits that *Total Service* offered you—as a customer of IMC.

SELLING SERVICES —

The Planalyzer is a good example. Here was a twelve-month sales calendar that channeled responsibility and due dates for an orderly completion of the total sales activity. More help is yours in terms of "how to" manuals on Market Analysis, Sales Manpower, Promotion, Transportation, Technical Service; a complete kit on Farmer Meeting methods.

MANAGEMENT HELP —

in setting up insurance and safety programs; establishing credit and collection systems . . . with detailed manuals to help keep the programs current and aggressive. IMC executives have consulted with many manufacturers at Skokie on a wide range of management prob-

lems and offer this same service to you.

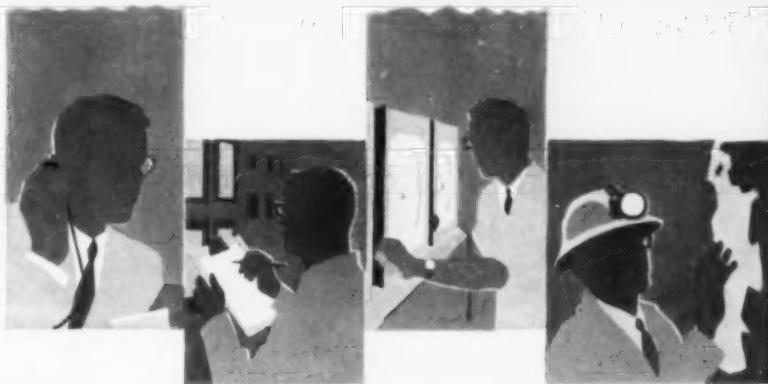
CUSTOMER SALES TRAINING —

Last year we held 20 two-day meetings in cities across the country . . . to present sales ideas and techniques to customer salesmen. 849 men attended — company presidents, sales management, sales staff members. IMC sales executives are prepared to bring sales assistance of this kind directly to your plant.

TECHNICAL SERVICE —

is offered on a regularly scheduled, planned basis and embraces your total manufacturing operation. It is a preventive service — symbolized by IMC's Preventive Maintenance Checklist. We're on call for emergency techni-

TOTAL SERVICE



DOES FOR YOU

cal help, too. And all of the technical people involved know the fertilizer business from product mine to finished goods.

TRANSPORTATION SERVICE —

We maintain the industry's largest transportation personnel staff — to serve you in all areas. This applies whether it is products you buy from us or finished goods you sell your customers . . . whether the ingredient or fertilizer moves by rail, truck, barge or vessel. The "extras" include just about every phase of transportation . . . from loading methods to complex freight rate problems.

MOST COMPLETE LINE OF FERTILIZER MATERIALS —

All IMC services are keyed to a full product

line . . . one source that combines product and service into a major contract benefit. It means more skillful representation . . . on a frequent routine. It means conveniences for you in purchasing, in contact time, in scheduling, in handling materials at storage points.

Products and Services from IMC

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- Triple Superphosphate (Coarse, Granular, Run-of-pile)
- Phosphoric Acid
- Muriate of Potash (Coarse, Standard, Granular)
- Sulphate of Potash
- Sul-Po-Mag

Manufacturing and Technical Service
Transportation Service
Customer Service
Management Service
Marketing Services

Products for Growth®



A contract with IMC is our pledge of TOTAL SERVICE. If you have not already availed yourself of all these services, we invite you to do so.

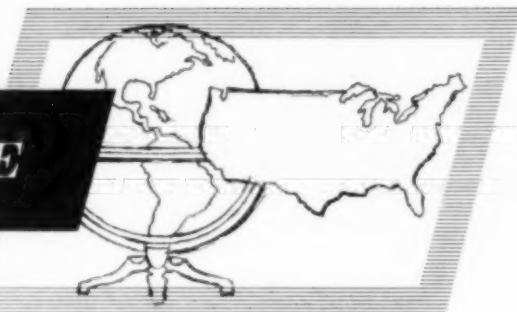
AGRICULTURAL CHEMICALS DIVISION

INTERNATIONAL MINERALS & CHEMICAL CORPORATION

Administrative Center: Skokie, Illinois

21-60

NEWS about the TRADE



New Custom Grinding Co.

Fine Grinding Corporation, 241 East Elm St., Conshohocken, Pa., will begin operations Apr. 15. Adequate facilities are available for custom air mill grinding on agricultural chemicals and other commodities. The company also will do research and development work on new products. Executive vice president is Joseph P. McKenna, well known in the agricultural chemical field for the past 25 years.

Residue Approval Delayed

Suppliers of agricultural chemicals which were brought under federal control last month—nematicides, plant regulators, defoliants, and dessicants—are being given additional time to register their products with the Department of Agriculture and get residue tolerance approvals from the Food and Drug Administration.

North Central Branch Of ESA Meets In Milwaukee

The North Central Branch of the Entomological Society of America met at the Hotel Schroeder in Milwaukee, Wis., March 23 to 25.

In a forage crop inspection section, a panel composed of G. C. Decker, Illinois Natural History Survey, Urbana; P. A. Dahm, Iowa State University, Ames; J. E. Fahey, ARS, USDA, Vincennes, Ind.; G. W. Ware, Ohio State University, Columbus; and M. C. Wilson, Purdue University, Lafayette, Ind., discussed insect residues on forage crops. The discussion brought out residue problems for presently-recommended materials as well as for alternate chemicals

Congress has given the USDA authority to defer the provisions relating to registration for one year for chemicals which do not leave a residue and those which do leave a residue but had been on the market prior to Jan. 1, 1958.

Canada Society To Meet

The tenth annual meeting of the Entomological Society of Canada and the eighth annual meeting of the Entomological Society of Saskatchewan will be held jointly at Saskatoon, Saskatchewan, Sept. 12 to 14.

DiDario Joins Diamond

Albert DiDario has joined Diamond Alkali Co., Cleveland, as biologist, agricultural chemicals in the research department. He had been connected with the Oliver Corp. as an entomologist.

required because of the recent changes in Heptachlor labelling.

An entire half-day of the meeting was devoted to topics on the effects of pesticides on wildlife. Among those heard were: T. G. Scott and W. H. Luckman, Illinois Natural History Survey, who discussed the effect of Dieldrin on wildlife and insects in general where the material was used in an area control program against the Japanese Beetle. Also, a panel discussed the pesticide-wildlife relationships on a national basis. On the panel were G. C. Decker; W. H. Dykstra, Fish and Wildlife Service, Washington, D. C.; and C. H. Hoffman, ARS, USDA.

Forms Consulting Firm

Joseph L. Prosser has announced the formation of Joseph L. Prosser Co., Inc., Glenarm, Md. The new firm offers engineering and consultant services to the plant food industry. The firm will engage in the preparation of feasibility studies, preliminary economic surveys, building and equipment layouts, cost estimates, machinery arrangements, and engineering drawings and specifications.

Mr. Prosser had been chief engineer for a major fertilizer manufacturing company.

Sommer Heads Monsanto

Charles H. Sommer was elected president of Monsanto Chemical Co., St. Louis, March 23, and Charles Allen Thomas was elected chairman of the board. Mr. Thomas had been president and Mr. Sommer was executive vice president.

Multiwall Prices To Rise

David L. Luke 3d, executive vice president of the West Virginia Pulp & Paper Co., New York, said last month that increases are being made in prices of multiwall sacks. The increases average about 8%.

Fertilizer Use To Be Record

Fertilizer consumption for the crop year ending June 30 will equal or surpass the record level of fiscal 1959, according to Anthony E. Cascino, marketing vice president of International Minerals & Chemical Corp., Skokie, Ill.

Mr. Cascino based his prediction on the expected increase in cotton and corn plantings and a fast recovery in sales that have been delayed by snow.

Velsicol Appoints Three



J. F. Kirk



A. B. Chadwick

John F. Kirk, vice president of Velsicol Chemical Corp., Chicago, has been named executive vice president of the company. He had been vice president since 1954 and, in 1958, was named to the board of directors.

At the same time, A. B. Chadwick was named vice president in charge of manufacturing and engineering, and Bernard H. Lorant was named vice president in charge of research and elected to the board of directors.

Suspend Canadian Activity

Potash Company of America Ltd. has engaged Cementation Co. (Canada) Ltd. to proceed with a grouting program throughout its mine shaft near Saskatoon, Saskatchewan. It is estimated that a year will be required to complete this work and all other activity at the mine has been suspended.

Cementation Co. has been doing work in the Saskatoon shaft since early November to reduce the flow of water. The new program will cover all sections of the shaft.

V-C Retirement Plan

A formal, non-contributory retirement plan for its 3,400 employees has been outlined by the Virginia-Carolina Chemical Corp., Richmond, Va. The plan, effective July 1, provides retirement allowances for all employees who are 65 and have 15 years of service, or are 55 with 20 years of service.

The company will pay the entire cost of the benefits. No contributions from employees will be required.

ACS Meeting April 5-14

The Division of Agricultural and Food Chemistry of the American Chemical Society will hold its sessions at the Statler-Hilton Hotel during the 137th ACS national meeting in Cleveland, April 5 to 14.

Among the speakers scheduled to appear on the program of the Pesticides subdivision are William F. Barthel, Robert T. Murphy, and W. G. Mitchell, who will discuss insecticide residue studies which were designed to discover the fate of heptachlor in the soil following granular application to the surface. The progress in isolation and structure determination of the gypsy moth sex attractant will be disclosed by Martin Jacobson, Morton Beroza, and William A. Jones.

Dominican Tariffs Reimposed

Imports of fertilizers, insecticides, herbicides, fungicides and related items no longer are exempt from Dominican Republic import fees and other taxes. These charges will total about 33 per cent of the value of the goods imported.

Union Bag Names Brown

The Union Bag-Camp Paper Corp., New York, has appointed Lawrence G. Brown to the newly-created post of director, research and development for the company.

Producers Of Benzene Hexachloride Dwindling

BENZENE hexachloride, at one time a major cotton pesticide, now is in danger of fading from the pesticide market altogether, according to a report published by the *Oil, Paint and Drug Reporter*.

In 1951, BHC's peak year, 117 million pounds gross were made. In 1959, the report said, output had shrunk to 12.5 million pounds. Nine years ago there were 16 producers and now there are only five. Among the factors listed as reasons for this were: rising costs, dropping prices diminishing profits, stiff competition from other insecticides, declines in exports, and mounting insect resistance. In addition, officials both in the business and very recently out of it are reported as saying that not enough money was spent on promotion of BHC.

In the early 1950's demand for BHC was so strong that trucks were hijacked. Mississippi alone, in a normal season, consumed 66 million pounds of dust. BHC in combination with DDT and sulfur was the major cotton pesticide.

In 1950-51, however, a sulfur shortage caused the government to recommend mixtures which excluded sulfur. Agricultural research stations consequently recommended new formulations and new insecticides. Shortly thereafter, such new products as Toxaphene, Aldrin, Dieldrin, Heptachlor, Methyl Parathion, and Malathion were developed and were heavily

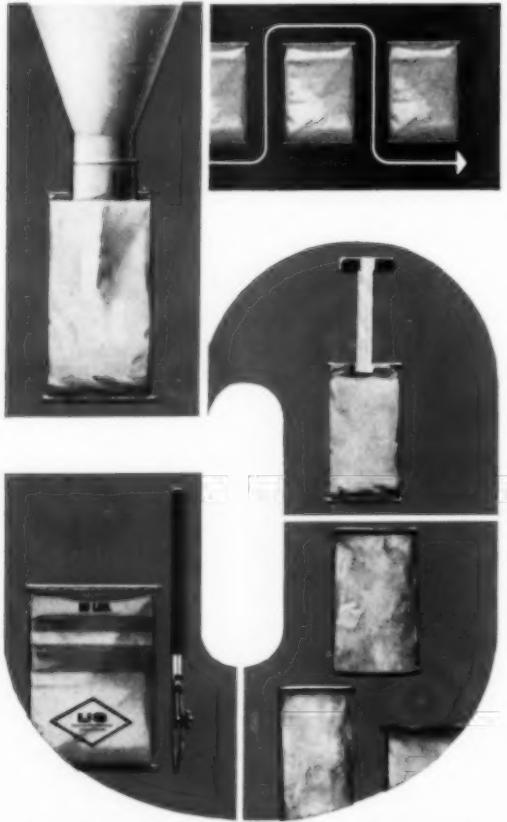
promoted. These products took over the bulk of BHC's former markets.

Another problem confronting BHC is resistance. The industry is convinced that reports of insect resistance to BHC, whether a serious factor or not, have influenced a switch in consumer demand to other materials.

BHC producers hope to regain some of their volume because of a more favorable price schedule this year, and by putting more effort into research and promotion. "We should have made hay out of the fact that BHC was used last fall in New Jersey to control the encephalitis epidemic — and that it killed mosquito larvae without injuring other wildlife," one producer is reported to have said. The industry also hopes that it can profit from the USDA's campaign against the boll weevil, which will begin at a new laboratory to be constructed at Mississippi State University. The department has begun a weevil-eradication campaign and Congress has appropriated \$1.1 million as a start. BHC producers are hopeful that some of this money will be used in research favorable to their product.

In conclusion, the report said, producers hope to restore other markets to BHC aside from the cotton south—as well as move into new fields which appear to be promising.

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Hunter Heads Escambia Sales

James A. Hunter has been named product sales manager — agricultural chemicals for Escambia Chemical Corp., Pensacola, Fla. He is responsible for the sale of Escambia's nitrogen products and, in that connection, will work with Ashcraft-Wilkinson Co., Atlanta, Ga., the exclusive sales agents for Escambia's nitrogen products.

Mr. Hunter had been with the sales department of the Texas Gulf Sulphur Co. and formerly was with Armour Fertilizer Works and National Potash Company.



Nitrogen-Fixing Catalyst

Chemists at E. I. du Pont de Nemours & Co., Wilmington, Del., have found a way to fix nitrogen by using enzymes extracted from bacteria. The freed extracts can convert nitrogen gas to ammonia and other nitrogenous compounds. Preliminary work shows conversions greater than 1 per cent.

Research on the mechanism of nitrogen fixation in micro-organisms has been carried out for several years at the Du Pont experimental station in Wilmington by Dr. James E. Carnahan, Dr. Leonard E. Mortenson, Dr. Howard F. Mower, and Dr. John E. Castle.

In fundamental studies on this important reaction, the Du Pont team found that enzymes will fix atmospheric nitrogen if two major conditions are met. The bacteriological cells must be broken carefully enough to permit the release of the enzymes without inactivating them; and a pyruvic acid salt activates the fixation reaction.

Dr. Carnahan hopes the Du Pont work will lead to a better understanding of the chemistry of nitrogen fixation. His second aim is to characterize the nitrogen-fixing enzyme. This may point to the active part which might serve as a "model" for nitrogen-fixing catalysts. Present commercial processes, he explains, are "brute force" reactions which use inorganic catalysts at high temperatures and pressures; enzyme fixation would

take place under mild temperature and pressure conditions.

Finally, this basic knowledge would, he feels, help define the catalytic chemistry of nitrogen. Its ultimate practical value, Dr. Carnahan concludes, would lie in the vital contribution to plant and animal nutrition.

Supreme Court Bars Review

WASHINGTON, March 28—U. S. Supreme Court has refused to review the decision of a lower court in the suit brought by 13 Long Island residents seeking to bar aerial spraying of DDT. Federal courts had refused to issue an injunction against the spraying.

Anti-Pesticide Propaganda Repeated In Book Form

The Poisons In Your Food, by William Longgood. Published by Simon and Schuster, New York. 227 pages, price \$3.95.

THE theme of Mr. Longgood's latest tirade against insecticides is a familiar one. In this latest installment he summarizes all of the half-truths and downright perversions of fact into a scare campaign designed to convince the reader that the national health is being endangered, and we are all going to develop cancer, as a result of use of pesticides.

The two major deficiencies in Mr. Longgood's volume are that he obviously is unqualified by lack of any scientific training or experience to write on such a technical subject as this,—and he is openly trying to build up a case *against* pesticides and fertilizers, rather than seeking out the truth about them. He ignores any testimony or opinion that disagrees with his pre-conceived opinion that chemical aids are a menace.

In this volume, for the first time, he comes out into the open as an out-and-out disciple of the "organic gardening" school, citing the old unsupported theme that if we would simply abandon the use of "chemical" fertilizers and use organic nutrients exclusively, we could raise crops that would be immune to insect attack—thus dangerous modern pesticides would become unnecessary.

Although inaccurate and biased, Mr. Longgood's book should still be read by those in the pesticide and fertilizer industry, on the premise that it is important to

know the nature and the menace of the attacks being made on the agricultural chemical industry and its products.

The plot, as indicated above, is familiar, and so are the characters. Lined up on the side of the "bad guys" are not only the manufacturers and applicators of pesticides and fertilizers, but the USDA, Congress, newspapers and magazines, and the advertising profession, to name a few. The "good guys", also, are the same old crowd. Those quoted include: Dr. Morton S. Biskind, DDT hater of years standing; Carlton Fredericks, radio nutritionist; Robert Cushman Murphy, retired curator of birds; and Dr. Malcom M. Hargraves, whose DDT opinions have been deemed unacceptable in Federal Court. Dr. Biskind apparently is the hero, as his quotes seem to appear on every other page.

Although Mr. Longgood majored in gypsy moths during his early entomological training and received his degree from New York *World Telegram* for his thesis on the gypsy moth campaign, he devotes less than two pages of his book to that topic. As to the verdict of the federal court which heard the case Mr. Longgood says "But because the plaintiffs could not produce a human corpse to prove that the spray was harmful to humans, the Federal judge ruled against the plaintiffs."

Despite this and a host of other misleading statements the book is well worth \$3.95 and should appear in the best seller lists soon,—in the fiction category.

"True" Scores Pesticides

National Magazine Article Cites Cancer, Deformity, Sterility As Spray Results

TRUE, the man's magazine, in its March, 1960 issue carries a five-page article entitled "Farm Fallout Can Kill You!" by Hart Stilwell, a free-lance author whose qualifications to write authoritatively on the topic are unknown.

In the event that the headline might fail to impress some of *True*'s more hardy readers, the editors have provided a sub-head that reads: "In the headlong race to kill every bug and weed in sight, chemists are spreading a blanket of mysterious death over the land." Also appearing on the title pages is a two-page picture of an airplane dusting a field.

Setting the tone of the article, Mr. Stilwell writes: ". . . we and our unborn children, together with much of our fish and game, face a future of sterility, deformity, and a possible tremendous upsurge of cancer, because of poisons being flung almost heedlessly about the country." He was referring to amino triazole and its relation to the cranberry situation last fall, and, of course, made no mention of the statement by Dr. J. T. Thurston, manager of research and development, Agricultural Division, American Cyanamid Co., who said, at the time, that "amino triazole may be used in accordance with directions and accepted application practices without fear of injury to either users or consumers."

Since very little was done by the author or the editors of *True*, the man's magazine, to present both sides of the picture, AGRICULTURAL CHEMICALS has done the research for them and herewith presents a few of the facts that were readily available to anyone interested in reporting impartially.

The article states "We've gone poison crazy. Little Johnny eating his apple a day to keep the doctor away is probably being poisoned. Most fruit is sprayed, and these poisons won't rub off or wash off. The mother nursing her precious baby may be poisoning it. Anyone having his home debugged is probably poisoning himself and his family." Mr. Stilwell could have checked U. S. Food and Drug Administration's Leaflet No. 6 entitled "Protecting Crops and Consumers" which states as follows: "Because we do not want harmful amounts of residues of agricultural chemicals in our foods, rules for their safe use are provided by law. The tolerance is specific for the pesticide and the crop. It is set by regulation."

Mr. Stilwell states: "it is impossible to back out of this sea of poison. Utter chaos would follow, for we must artificially maintain the artificial balance we have created in nature." Had Mr. Stilwell consulted Dr. George C. Decker, head of the section of economic entomology, Illinois Natural History Survey, Urbana, he might have been informed that man, himself, has been the primary factor in upsetting the so-called balance of nature and pesticides usually are used to suppress an organism already out of balance. In an address before the Ecological Society of America in 1958, Dr. Decker said that when man cleared the forests, plowed the prairies, drained a marsh, or dammed a stream, he altered an entire environmental complex and set up an entirely new set of opposing forces which, if left uninhibited, would establish an entirely new biotic equilibrium. Presumably it is obvious to all,

Dr. Decker pointed out, that nature's balance is not a static condition, but rather that it is a fluid condition changing from day to day.

The article quotes Dr. M. M. Hargraves as follows: "Dr. M. M. Hargraves, famed cancer specialist of the Mayo Clinic, says, 'I believe the vast majority of patients suffering from blood dyscrasias and lymphoid diseases have a significant history of exposure to the various hydrocarbons, which, in turn, include most of the pesticides of today'." This is the same Dr. Hargraves, of course, who was involved in the suit by Long Island residents who sought to have the government restrained from spraying public lands during the 1957 gypsy moth campaign. Of Dr. Hargraves, Judge D. J. Bruchhausen said, in his decision on the case, "While the witness is a physician of long experience, he has not indicated sufficient knowledge of the effects of DDT for acceptance of his opinions."

In conclusion, Mr. Stilwell states "Anyone wanting to see tangible proof of the effects of the most widespread poisoning — the fire ant eradication waged by the U. S. Department of Agriculture widely in the South in the last several months — can go look for himself." For background material on this program, Mr. Stilwell would have had to go no farther than the August, 1958 issue of *True*, the man's magazine, which carried an article entitled "The Fire Ants Are Coming," in which the following statement was made: "The struggle between man and insects is perhaps the most serious conflict in the world today. Dr. Donald Pillsbury of the Philadelphia Academy of Natural Sciences attended a meeting where the problem of the fire ant was discussed. Afterward, Dr. Pillsbury said despairingly, 'there is a great war on between men and insects. I wonder when I hear what I did this afternoon if man is going to win.' ★

Czech Nitrogen Plant

A nitrogen plant, which, by 1963, is expected to be producing more nitrogenous fertilizers than presently are manufactured in the whole of Czechoslovakia, will be put into experimental operation in 1962. The plant, situated in the Waag Valley, will be fed with natural gas by a pipeline leading from Western Slovakia.

FDA Asks Tighter Controls

In hearings last month before a House Appropriations Subcommittee in Washington, D. C., FDA commissioner George Lerrick said that the problem of pesticide residues in foods "is a growing one." He said that the agency's budget for fiscal 1961, which begins July 1, calls for "special emphasis" on the pesticide problem.

Farmers, Mr. Lerrick claimed, are not only using insecticides and herbicides on more crops but "new and more complex pesticides are reaching the market all the time." Almost all these chemicals, he asserted, are poisonous to humans "in some degree."

In its request for new spending authority in fiscal 1961, the FDA is asking for nearly \$16.9 million, up \$2.7 million from this fiscal year. Mr. Lerrick claimed that this would permit the agency to add 340 new persons to the regular staff, bringing it to a total of 2,000 persons. The additional personnel, he explained, would enable FDA to spend more time testing pesticides.

Heads Hooker Division

James G. Baldwin has joined Hooker Chemical Corporation as general manager of its Western Chemical Division. He had been manager of chemical sales for Collier Carbon and Chemical Corp., Los Angeles.

In other appointments announced by the company, Russell O. Vognild was named sales manager of the Western Chemical Division, succeeding Horace W. Hook-

er, who will move to the company's new corporate headquarters at 660 Fifth Ave., New York, this summer.

Hitchner Speaks To Committee



Wisconsin Governor Gaylord Nelson (left) is shown with Lea S. Hitchner, executive secretary of the National Agricultural Chemicals Association, at a meeting of the Wisconsin committee to survey the use of chemicals in agriculture. Mr. Hitchner offered the group the full cooperation of the pesticide industry. The committee was created by Governor Nelson in an effort to develop a decisive and consistent public policy in regulating the use of agricultural chemicals.

Join Sulphur Institute

The Sulphur Institute, Washington, D. C., a newly-formed research organization, has announced the appointments of Dr. Moyle S. Williams as chief economist and Dr. Samuel L. Tisdale as chief agronomist. Both men had been with the National Plant Food Institute.

Dr. Tisdale is in charge of the institute's program of research and education in connection with the use of sulphur for agricultural purposes. He is located in the Washington office.

Dr. Williams is in charge of economic research and development for the Sulphur Institute. He also will serve as economic advisor to the institute staff, and will provide liaison between the institute and professional organizations and institutions concerned with economic research in both the industrial and agricultural fields.

Extend Membership Scope

The Association of British Manufacturers of Agricultural Chemicals, London, has revised its membership rules to create a category of associate membership, open to firms which manufacture crop protection chemicals in a country other than England and sell them on a substantial scale in the United Kingdom.

Utah Pest Control Meeting

The fifth annual convention of the Utah Pest Control Association was held March 5 in Salt Lake City. William G. Nunn, newly-elected president of the group read a report from Dr. H. H. Cole, director of industrial health for American Cyanamid Co., concerning effects on rats and dogs caused by administration of amino triazole.

After five years of testing, Dr. Cole concluded that there was no risk to man from amino triazole's proper use as a herbicide. His report said that it was impossible for an individual to absorb a harmful dose from "either one or a small number of exposures, short of a suicide attempt." The report said the only harm shown to rats in the tests was that it inhibited activity of the thyroid gland when it was administered steadily and in large doses.

Plant Construction To Rise

The Manufacturing Chemists Association predicts that the cost of facilities to be built for fertilizer manufacturing and research during 1960 will total \$75.3 million. The totals were reached through the Association's annual construction survey.

Construction already begun, according to the report, totals \$43.8 million and the remaining \$31.5 million is for facilities scheduled to be started this year. A figure of 29 fertilizer construction projects was listed.

During 1959, the cost of new chemical production and research facilities came to only \$11 million.



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Two Retire At Bemis

The Bemis Bro. Bag Co., St. Louis, Mo., has announced the retirement of two vice president-directors; H. P. Claussen of the company's Boston offices, and R. M. Hersey, of the Minneapolis office.

Mr. Claussen joined Bemis in 1916 and Mr. Hersey has been with the company since 1914.

Joins International Office

Richard M. Sibley has joined the International Sales office of Dorr-Oliver Inc., Stamford, Conn. He has been with D-O for four years, most recently serving as a sales engineer in the Pittsburgh, Pa., office.

In his new position, Mr. Sibley is responsible for sales and services in Venezuela and the Caribbean area.

Princeton Center Complete

Food Machinery and Chemical Corp.'s chemical research and development center at Princeton, N. J., has been completed on schedule and now is fully staffed.

In addition to research personnel, the center houses inorganic product application and sales service groups formerly associated with FMC's Becco Chemical, Chlor-Alkali, and Mineral Products Divisions, as well as FMC's chemical patent department.

Monopolies Committee Reports On English Fertilizers

A REPORT has been issued by the British Monopolies Commission on the supply of chemical fertilizers in England that clears the leading fertilizer manufacturers—I.C.I., Fisons, British Basic Slag, and S.A.L.—from any suggestion of using their "monopoly" positions against the public interest.

There are two qualifications, however. One concerns Fisons' pricing policy up to 1957, which is the final year covered by the report, and some disquiet is felt about the import company, Potash Ltd. The commission shows that Fisons' profits from fertilizers in the years from 1951 to 1957 averaged over 20 per cent on capital employed and, hence that prices must have been too high and this was against the public interest. Sir Clavering Fison, chairman of Fisons, commented that the company was satisfied with the report and that price reductions made in the past two years had brought the company into line with the average indicated by the commission.

The other main recommendation was that additional methods of strengthening the bargaining power of potash consumers should be sought. Potash Ltd. apparently is controlled through nominees by

French and West German potash producers and is "part of an international organization designed to eliminate competition," the report said. The commission stressed that everything possible should be done to develop alternate sources of potash supplies and it suggested trading with Canada, the U. S., the U.S.S.R., and Israel.

Basically, the commission has been seeking, for the past four years, to determine whether a situation of monopoly existed within the fertilizer industry, and, if so, whether the situation operated against the public interest. Its answers to both questions are quite definite. According to the British monopolies law, monopolistic conditions are deemed to prevail if any one company supplies more than one-third of the market for a particular product. In terms of the total home market for fertilizers, I.C.I. and Fisons each supply a third, while their share of individual products is much higher. The commission, however, does not in general consider this an unsatisfactory state of affairs. It points to historical reasons, to the large capital and research investment required, and to the enormous size of companies involved, as reasons for the industry's shape.

Lilly Forms Marketing Firm

Elanco Products Co. has been formed as a division of Eli Lilly & Co., Indianapolis, Ind., to market items in the fields of agriculture, industry, and home use.

George L. Varnes is president of the new company. He had been executive director of the Lilly agricultural

and industrial products division. With Lilly since 1940, Mr. Varnes has served as manager of materials control, general manager of operations, and executive director of operations planning, among other positions.

MACA Elects Officers

The Mid-West Agricultural Chemical Association recently held its first election at a meeting in Omaha, Nebraska. Robert Yapp of California Spray-Chemical Co. was elected president.

Other officers are: Herbert Woodbury, Woodbury Chemical Co., vice president, and G. E. Zackert, Imperial Chemical Co., secretary-treasurer. Besides the above officers, the board of directors is comprised of Harold Howard, Thompson-Hayward Chemical Co. and Porter L. Williams, Stauffer Chemical Co.

Set Tedion Tolerance

A tolerance of 2 ppm for residues of Tedion on six types of citrus trees when bearing fruit has been established by the U. S. Department of Agriculture. The miticide now may be used to control citrus red mite, six-spotted mite, and Texas citrus mite on trees carrying grapefruit, limes, oranges, tangelos, and tangerines.

A product of Niagara Chemical Division of Food Machinery and Chemical Corp., Middleport, N. Y., Tedion is available to growers as a 25 per cent wettable powder.

WACA Meeting Sept. 24

The 31st annual meeting of the Western Agricultural Chemicals Association will be held in the new Palm Springs Riviera Hotel, Palm Springs, Calif., Sept. 24 to 26.

Add to Sevin Label

Sevin insecticide has received label acceptance from the U. S. Department of Agriculture for use on four additional fruit crops—plums, prunes, cherries, and strawberries—according to its manufacturer, Crag Agricultural Chemicals, Union Carbide Corp., New York.

A residue tolerance of 10 ppm has been established for Sevin on these four crops. The carbamate pesticide will be available this season as a 50 per cent wettable powder.

Pesticide Facilities Operate

An explosion late in February at Diamond Alkali Co.'s Newark, N. J., pesticide plant has not interrupted deliveries of 2,4-D or 2,4,5-T. Facilities for production of the herbicides were demolished but the company had them back in operation by mid-March and ample stocks were on hand to meet deliveries.

Fruit Growers Meet

Connecticut Fruit Growers held their mid-winter meeting at the Connecticut Agricultural Experiment Station, New Haven, Feb. 21. Research findings and directions for applying fungicides and insecticides were presented by Neely Turner, head of the station department of entomology.

Arthur C. Bobb, University of Connecticut extension pomologist, presented the detailed 1960 recommendations for control of pests of apples, peaches, and pears and Dr. Patrick M. Miller of the station reported results of his experiments on apple scab control in 1959, and on the planting-time treatment of apple trees with materials known to control nematodes.

The complex matter of meeting consumer demand for clean fruit, free from damage and decay, while making sure that no undesirable or unsafe pesticide residues remain, was discussed by Mr. Turner; Dominic Zaccardi, resident in-

spector in Hartford of the Food and Drug Administration; and J. A. Noone, technical advisor, National Agricultural Chemical Association. The consensus of the discussion was that the demand for fruit free from damage and decay calls for the use of agricultural chemicals, and that these pesticides may safely be used on the crops specified, in the amounts specified, and at the time specified on the product label.

Montiel Joins Stauffer

Joseph H. Montiel has joined the Stauffer Chemical Co., New York, as a sales representative, Agricultural Chemicals Division. His headquarters are at El Centro, Calif.

Giorgi Joins Residex

Anthony Giorgi has joined the Residex Corp., Clark, N. J., as products manager. Residex formulates and distributes insecticides and herbicides.

Plan Third Korean Plant

A fertilizer plant with an annual capacity of 60,000 tons of urea and another 60,000 tons of ammonium phosphate is planned for construction in Korea. It will be that country's third modern fertilizer plant.

Construction funds for the project currently are estimated at \$29.5 million in U. S. currency plus three billion hwan. The plant will be built at Andong, 162 miles southeast of Seoul.

Vulcan Container Firms Merge At New Alabama Headquarters



A new company, Vulcan-Associated Container Companies, Inc., Birmingham, Ala., was formed last month, following the merger of seven container manufacturers.

The companies merged into the new corporation are: Vulcan Containers, Inc., Bellwood, Ill. Vulcan Steel Container Co., Birmingham, Ala.

Southwestern Steel Container Co., Dallas, Texas

Vulcan Containers Ltd., Toronto, Canada

Vulcan Containers (Canada) Ltd., Vancouver, B. C., Canada

Vulcan Containers Pacific, Inc., San Leandro, Calif.

Atlantic-Vulcan Steel Containers, Inc., Boston, Mass.

These companies manufacture a variety of sizes and styles of steel pails and drums and specialty tin cans.

Gordon D. Zuck is president of the new company. He had been president of the Birmingham, Dallas, and Boston companies participating in the merger. In a statement, Mr. Zuck said that, while the parent company will own all stock of the merged companies, each company will maintain its corporate identity and will operate individually in each area. The seven companies will



Gordon D. Zuck



V. I. McCarthy, Sr.

each function under the direction of its board of directors and staff of officers.

"We don't want this to be just another big company," Mr. Zuck said, "we intend to offer a special type of personalized service to steel container users across the country."

Vern I. McCarthy Sr. will serve as chairman of the board of directors of the new corporation. His headquarters are at Bellwood.

Fred A. Kusta, vice president of the Birmingham and Dallas firms, will serve as executive vice president of the new parent company. Paul H. Oberholtzer is the secretary of the new firm and Vern I. McCarthy Jr. is treasurer. Mr. McCarthy will retain his position as president and director of sales of the Bellwood company.



COPPER SULFATE

Tennessee Corporation mines Copper and converts it to Copper Sulfate at Copperhill, Tennessee. It is offered in powdered form as well as Large, Medium, Industrial, Granular and Snow Crystals.

Users who require very high uniformity and purity, but at a competitive price, specify TENNESSEE COPPER SULFATE.

Copper Sulfate and other copper chemicals



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Granules, Inverts Cited By Speakers

THE third annual meeting of the Weed Society of America was held in Denver, Colo., February 22-25, with the final day of the session coinciding with the annual Western Weed Conference. Featured on the program was a special panel discussion of "Progress and Problems in Registering and Recommending Herbicides," with W. B. Ennis, Jr., of the Crops Research Division of U.S.D.A. as moderator. Responsibilities of the chemical industry were covered by G. E. Lynn, Dow Chemical Co., the registration of herbicides by Justus C. Ward, Plant Pest Control Div. U.S.D.A., establishing and enforcement of tolerances by R. S. Roe, Food and Drug Adm., and the role of government researchers by H. L. Haller, U.S.D.A.

At another of the general sessions five speakers reviewed "The Role of a New Scientific Discipline in Agricultural Production." In his presidential address, A. S. Crafts, Univ. of California, discussed the past, present and future of weed control research. Hans Gysin of Geigy Chemical Corp., Basle, discussed the role of chemical research in developing selective pesticides, while weed control research in Europe was reviewed by E. K. Woodford, Oxford, Eng. M. W. Parker, Crops Res. Div., U.S.D.A., discussed research and organizational needs in the field of weed control.

The sectional sessions included, as usual, about 150 papers on control of weeds in turf, in agronomic crops, in horticultural crops, in pastures and rangelands, in forests, along rights-of-way and other industrial sites, control of aquatic weeds, public health and regulatory aspects of weed control, etc.

In a number of papers particular attention was given to the newer granular forms of herbicides. Wm. F. Meggitt, Rutgers

Reports Presented To Weed Society At Third Annual Meeting In Denver

Univ., New Brunswick, N. J., reported on "A Comparison of Spray and Granular Applications of Herbicides for Weed Control in Tomatoes and Potatoes." Generally, he reported, "granular formulations of most of the herbicides are much safer than sprays. Yields are reduced and foliage is injured by sprays, but not by granular applications. Granular formulations in most cases provide better, that is, longer lasting weed control.

"EPTC both as a spray and on a granular carrier, and CIPC, amoben, neburon, and simazin as granular applications provided satisfactory weed control with no injury to tomatoes. With the exception of EPTC, the sprays of these herbicides produced injury and yield reductions. In 1959 granular application of CIPC 10 days after transplanting produced very severe injury to tomatoes, but there was no injury when applied at later dates. In potatoes EPTC was the only material which provided effective weed control with no yield reductions. Application of EPTC at 6 lb./A. as a preplanting treatment provided excellent control of nutgrass as well as annual weeds throughout the growing season with only a hilling cultivation at lay-by. EPTC after the last cultivation also gave satisfactory control of annual grasses until harvest."

Another new form of herbicide application that has been attracting increasing attention over the past year or two is the "invert emulsion." A comparison was made of such "invert emulsions" with conventional oil-in-water emulsions (applied aerially) in a report by Harry E. Elwell, Crops Res. Div., U.S.D.A., Okla. Agr.

Exp. Station, Stillwater, Okla. He reported that "an invert emulsion of an ester of 2,4,5-trichlorophenoxyacetic acid (2,4,5-T) was equally as effective as an oil-in-water emulsion of the same ester when applied in May to post and blackjack oak."

In other tests designed to check drift of the two emulsions, tomato and cotton plants were used, set in series downwind and perpendicular to the line of flight of the applying plane. Determinable amounts of spray did not fall directly under the plane, but plant damage was apparent 50 feet from the upwind side. Oil sensitive cards placed on the ground beside the plants showed an average of 40 drops per card for the oil-in-water emulsion and 136 drops per card for the invert emulsion. Damage was noticeably greater on the cotton than on the tomatoes.

Three researchers at the Crops Research Div., U.S.D.A., Beltsville, Md., L. L. Jansen, W. A. Gentner and W. C. Shaw, investigated and evaluated the effect of surfactants on the activity of herbicides in aqueous systems. "In general," they reported, "the effectiveness of surfactants in enhancing herbicidal activity has appeared to be correlated best with the percentage composition of surfactant in the formulation. Surfactants have increased the activity of herbicides as much as 800 percent under certain conditions. The magnitude of the increased activity has been influenced by (1) the species, (2) the nature of the herbicide, (3) the initial level of herbicidal activity (without surfactant), (4)

(Continued on Page 109)



This special application makes the Yale tractor shovel stand out! Yale's 6-foot dumping clearance — highest in its field — means that Yale can load many types of trucks directly. Compare Yale power and acceleration against any other in its field. Only Yale gives you a torque converter and fully automatic transmission with a 72-hp. 6-cylinder engine. Compare Yale action! 2500-lb. carry capacity. Exclusive 45° bucket tipback assures stability and safety, minimum spillage. Compare Yale safety! Safety-curve lifting members never rise alongside the operator. Front and rear working lights for additional security. Compare Yale design! Rugged, simplified, more efficient. Brakes and electrical system sealed. 10-ply tires. Many parts interchangeable with Yale Gas trucks. Compare these features with a demonstration in your own plant. See why you'll save time and money.

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Canada Evaluates Pesticides

The Canadian Department of Agriculture, FDA branch, recently issued a directive outlining a policy on evaluating new candidate pesticides in its research branch.

Products submitted for evaluation need to be identified chemically and be accompanied by preliminary toxicity data to allow handling. Some data on phytotoxicity and summary reports of preliminary experimental work are also requested. The statement provides that work will be done at government expense, and that patents arising from the branch's findings would be issued in the name of the Crown.

Separate Screwworm Eggs

At the final session, Jan. 27, of the meeting of the Southeastern Branch, Entomological Society of America, in Savannah, Ga., Dr. William H. Cross, research entomologist, USDA, discussed a flotation method for separating eggs that will hatch into male screwworms from those that hatch into females. He said that this could effect considerable savings in a screwworm eradication program such as the one recently conducted in the southeast. The release of sterile females is a useless added cost, he explained.

Francis Named Stepan V.P.

Donald H. Francis, currently general manager of the Maywood Chemical Co., division of Stepan Chemical Co., has been made a vice president of Stepan, the parent company. He will continue to direct the Maywood Division's operations in Maywood, N.J., as general manager.

Bemis Bag Elects

Judson Bemis has been elected president and chief executive officer of the Bemis Bro. Bag Co., St. Louis, Mo. He succeeds his brother, F. G. Bemis, who was elected chairman of the board.

At the same time, C. W. Akin was elected executive vice presi-

dent, R. V. Scott and B. L. Willmore were elected vice presidents, and J. T. Braxtan was named assistant secretary.

Canner Award to Fairfield



Canner Packer magazine's Gold Medal award for an "outstanding" insecticide is presented to John A. Rodda (right), general manager of Fairfield Chemicals, Food Machinery and Chemical Corp., New York. Thomas Vought, representing **Canner Packer**, makes the presentation.

Fairfield's Pyrenone was one of fifty products chosen to receive the medal for "outstanding innovations or improvements in equipment or supplies used by processors of food." Pyrenone was the only insecticide product cited.

West Virginia Names Jones

Tom R. Jones has been named sales representative in western New York for the multiwall bag division of West Virginia Pulp and Paper Co., New York. He succeeds George H. Doherty, who has retired.

Mr. Jones will continue to service clients in Pittsburgh and western Pennsylvania, the company said.

Asks For Tolerance Basis

The California Assembly has passed a resolution requesting the FDA to announce the analytical methods and their sensitivities on which any zero tolerance is based, and on which any "no residue" usage has been officially accepted. In addition, the Assembly asked that announcements be made regarding the new status of a pesticide chemical if further data on pharmacology should cause a re-evaluation by the FDA.

Herbicide For Cotton Growers

Niagara Chemical Division, Food Machinery & Chemical Corp., Middleport, N. Y., has developed a postemergence herbicide for use with cotton. The product, Dicryl—N-(3,4-dichlorophenyl) methacrylamide — controls crabgrass, *Braharia*, morning glory, cocklebur, and other weeds common to cotton crops.

Dicryl has been tested for two years at Niagara's Jackson, Miss., research laboratory. Among the findings: rainfall one hour after application doesn't affect the herbicide's performance; and timing of the chemical's application is important to the cotton's safety. Niagara plans to continue field trials.

Heads Rohm & Haas Research

Dr. Charles H. McBurney has been appointed director of research for Rohm & Haas Co., Philadelphia. He succeeds Dr. Ralph Connor, who continues as vice president in charge of research and chairman of the board.

Dr. McBurney has served as assistant director of research for the past ten years.

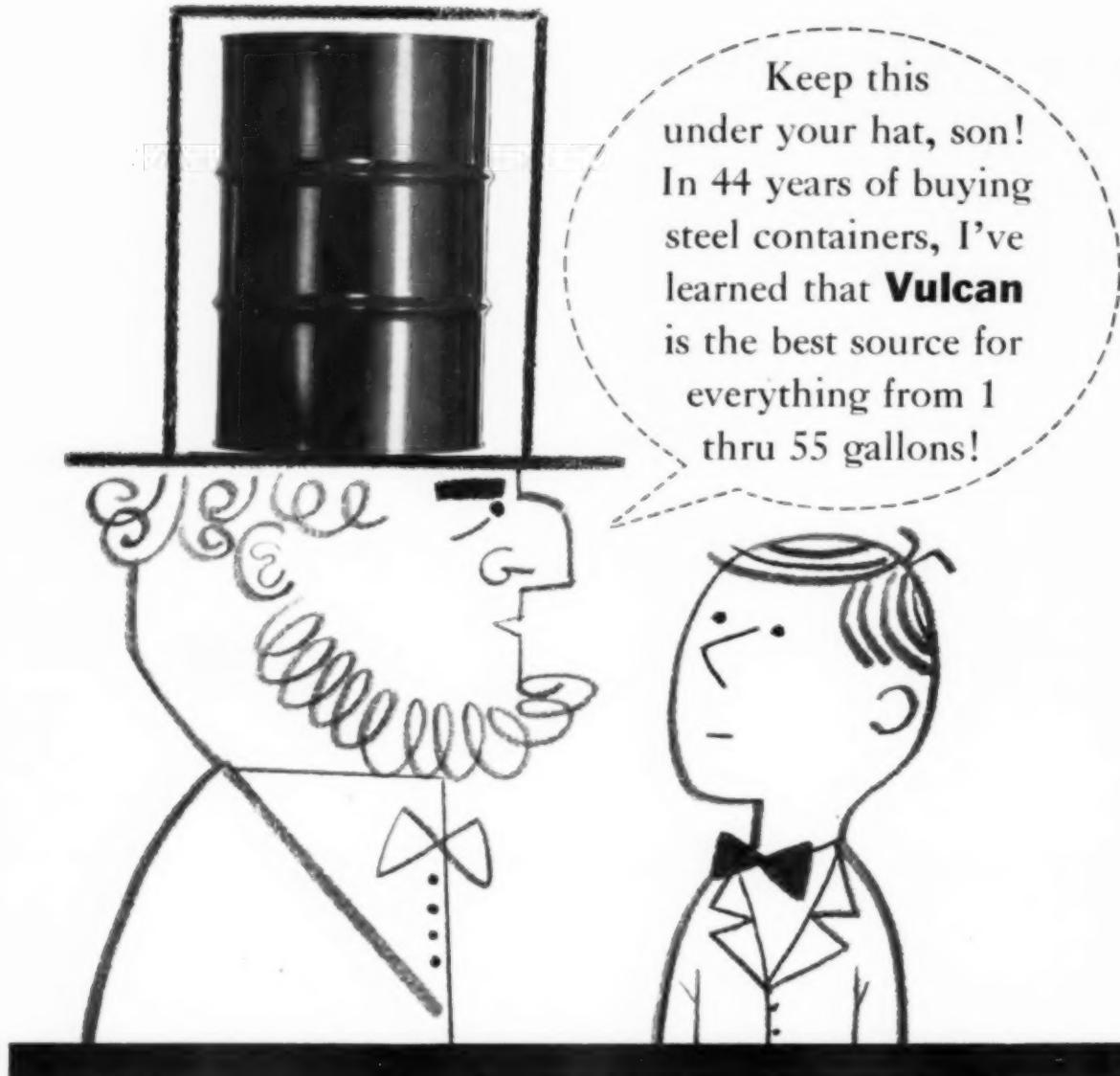
Novel Fertilizer Ads

Commercial Solvents Corp., New York, has prepared a full-page ad for its Hi-D ammonium nitrate fertilizer that features a color map of the United States and illustrates all 17 important soil groups, from alluvial to wisenboden soils. The advertisement is intended for consumer magazines, such as *Progressive Farmer*, *Farm Journal*, and *Successful Farming*.

George E. Campbell Dies

George E. Campbell, manager of the purchasing department of The American Agricultural Chemical Co., New York, died Feb. 21 at his home in Flushing, New York. He was 64.

Mr. Campbell joined the company in 1910. He was named assistant manager of purchasing for the firm in 1923, and manager of purchasing in 1940.



Keep this
under your hat, son!
In 44 years of buying
steel containers, I've
learned that **Vulcan**
is the best source for
everything from 1
thru 55 gallons!

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AC-40

AGRICULTURAL CHEMICALS

USPP Enlarges Its Technical Services Department



J. A. Shamp



H. B. Tatum



R. D. Graf



R. L. Hall

U. S. Phosphoric Products, Division Tennessee Corp., Tampa, Fla., has enlarged its technical services department under the direction of H. B. Tatum, who now is located in Tampa. He has been with USPP since 1936.

The company also has appointed three technical service representatives. They are: Robert D. Graf, whose terri-

tory consists of Minnesota, Wisconsin, North Dakota, South Dakota and the northern parts of Iowa and Illinois; Robert L. Hall, who services customers in Indiana, Ohio, Michigan, and Kentucky; and John A. Shamp, whose territory is Kansas, Missouri, Nebraska, Arkansas, Texas, and the southern parts of Iowa and Illinois.

Dotzenrod Joins Crag Sales

Richard T. Dotzenrod has been appointed a sales representative for Crag Agricultural Chemicals, Union Carbide Chemicals Co., Union Carbide Corp., New York. His headquarters are in Winchester, Va.

Kickapoo Buys Koos Firm

Kickapoo Fertilizers, Stevens Point, Wisc., has purchased a controlling interest in N. S. Koos & Son Co., Kenosha, the largest fertilizer firm in Wisconsin.

Bayard Baldridge, executive vice president and general manager of Kickapoo, said that the new management would continue to operate with the present Koos brand names and through present distribution channels. New officers of the Kenosha firm are Philip Q. Sawin, president; Mr. Baldridge, executive vice president and general manager; Raymond A. Russell, secretary; and Dorothy M. Sawin, treasurer. Mr. Sawin also is president of Kickapoo Fertilizers and Mr. Russell is secretary.

Ezra Kraus Dies

Dr. Ezra J. Kraus, one of the developers of 2,4-D, died last month in Corvallis, Oregon. He was 74 years old.

Dr. Kraus helped to develop 2,4-D as a herbicide, discovered the basic carbohydrate-nitrogen growth-ratio principle in plants,

did pioneer work on plant-growth regulators, and developed scores of new chrysanthemum varieties. He started his career as a plant physiologist at Oregon State College in 1908. He left in 1919 to join the staff of the University of Wisconsin and in 1934 became chairman of the botany department at the University of Chicago. When Dr. Kraus retired from Chicago in 1949, he returned to Oregon State to become visiting professor in horticulture.

Michigan Names Two

Michigan Chemical Corp., Saint Louis, Mich., has appointed Thomas B. Sparks as product sales manager of industrial chemicals, and I. M. Anderson as technical service representative of magnesia sales.

Drop Westvaco Name

The Food Machinery and Chemical Corp., New York, has dropped the name Westvaco from its divisional and branch identifications. The former Westvaco Divisions now are known as the Chlor-Alkali and Mineral Products Divisions of the corporation.

Chlor-Alkali Division is a producer of caustic soda, chlorine, soda ash, and solvents. Mineral Products Division manufactures phosphates, barium products, and magnesias. These chemicals and all other products of the two divi-

sions formerly identified with the Westvaco name, now are known as FMC chemicals.

Dri-Die Marketing Group

National Biocides, Inc., Memphis, Tenn., has been organized to act as primary distributor of Davison Dri-Die products in all states east of the Rocky Mountains. The new company will market Dri-Die 67 and applicator, and Dri-Die Pet Powder. Dri-Die, a silica gel insecticide, is a product of W. R. Grace & Co., Davison Chemical Division.

E. Kyle Ruble, formerly product sales supervisor at Davison, has joined National Biocides as vice president and general manager.

Add to Thiodan Uses

The U. S. Department of Agriculture has approved label claims for Thiodan insecticide that include control of four more potato pests and the Mexican bean beetle. In addition, Thiodan is approved for control of aphids on melons, cucumbers, summer squash, and winter squash.

Thiodan is produced by the Niagara Chemical Division of Food Machinery and Chemical Corp., Middleport, N. Y.

Climax Consolidates Offices

American Metal Climax, Inc., has consolidated its New York corporate and division offices in the American Metal Climax Building at 1270 Avenue of the Americas, New York. Among the divisions included are Climax Molybdenum Co., Mining and Exploration Division, Southwest Potash Corp., American Climax Petroleum Corp., and AMCO division.

Dixie Company To Build

Construction is scheduled to start next month on a fertilizer plant at Meridian, Miss., by the Dixie Fertilizer Co. The plant will utilize wastes from the Meridian sewerage disposal plant. It will be the first operation of its type to be located in Mississippi.

Increase Bromine Production

Additional brine wells have been completed at the Filer City, Mich., plant of Great Lakes Oil & Chemical Co. that increase the plant's basic bromine capacity by 70 per cent. The company's methyl bromide production also has been increased by 40 per cent during the past 12 months.

Kemp Heads Y. & T. Branch

Neal J. Kemp, manager of the Yale Industrial lift truck and tractor shovel sales and service branch in Detroit, has been named manager of the Chicago branch by the Yale Materials Handling Division, The Yale & Towne Manufacturing Co., Philadelphia. He suc-

ceeds Arthur H. Dobler who has been named an executive officer of the division.

Carbyne Distributors Named

Spencer Chemical Co., Kansas City, Mo., has appointed distributors in six western states for Carbyne wild oat herbicide. Sales of Carbyne will be made on a limited basis this spring.

The distributors are: Montana Flour Mills, Inc., Chipman Chemical Co., and AGSCO, Inc. in Montana; Selco Supply Co., Colorado and Wyoming; Miller Products Co. and Chipman Chemical Co. in Idaho, Oregon, and Washington; and Chipman Chemical Co. in Utah.

Aquatic Weed Control Conference Held March 1 In Chicago

THIRTY-ONE aquatic weed control operators from six north central states — Minnesota, Wisconsin, Michigan, Illinois, Indiana, and Ohio — met with conservation officials and state research personnel at Chicago, March 1 in the first annual Aquatic Weed Control Conference. The conference was sponsored by the Chipman Chemical Company of Chicago, Ill.

Dr. B. Domogalla, a weed control operator from Butler, Wis., said that the Wisconsin representatives are in favor of the formation of an aquatic weed control organization. Woodrow Fleming, a biologist and operator from Columbus, Ind., pointed out that, since aquatic weed control is becoming more and more specialized,

closer cooperation between research workers and operators is needed.

Kenneth Mackenthun, Wisconsin state biologist, was elected temporary chairman to preside over a representative committee elected at the meeting to present organization plans at the group's next conference. Among those on the committee are: Dave Papier, fisheries biologist for Ohio; Mr. Fleming; Boyd Lindberg, operator from Illinois; James Smith, landscape architect, Detroit; Ed Longten, biologist-operator from Minneapolis; Dr. Frank F. Hooper, chief biologist, Michigan conservation department; Paul Eller, Chipman Chemical Co.; and Harold Jones, American Smelting and Refining Co., Memphis, Tenn.

A panel of state conservation officials at the conference discussed state regulations on pollution of state waters. Panel members are (left to right): Kenneth Mackenthun, Wisconsin water pollution commissioner (standing); David Papier, Ohio; Alvin Lopinot, Illinois; Donald Leedy, Indiana; Edward Bacon, Michigan, and Edward Longten, Minnesota.



Houston Named By Pennsalt

Kenneth L. Houston has been appointed as technical sales representative by the Agricultural Chemicals Division, Pennsalt Chemicals Corp., Tacoma, Wash. He is headquartered at a new Pennsalt office in St. Louis, Mo., and his territory includes Missouri and Kansas.

Soil Treatment Controls

Experiments indicate that soil treatment eventually may replace tree spraying to control the plum curculio in peach orchards, the U. S. Department of Agriculture reported last month.

Orchard tests, conducted by Oliver J. Snapp, Agricultural Research Service, Fort Valley, Ga., indicated that several insecticides are capable of giving good control of the pest. Aldrin, Dieldrin, and Heptachlor were used in the tests. They were spread in the spring on the ground under trees at a rate of about two pounds per acre and mixed with the top layer of soil. The treatment controlled the curculio by killing the pest before it could emerge from the ground. Similar results were obtained with all three of the chemicals.

Industry Award To Weibel

Howard A. Weibel, manager of the garden chemicals section of E. I. du Pont de Nemours and Co., Wilmington, Del., was honored as an outstanding leader in the garden chemical industry at a meeting of the Wilmington Sales Executives' Club Feb. 29. He received the "Leaders of Industry" award presented by *Garden Supply Merchantiser*.

Trio Uninjured In Blast

Three workers escaped injury last month in an explosion which blew out the doors and part of the roof of the Reagent Chemical Corp. plant in Middlesex, N. J. The explosion occurred as the three men were bagging sulfur dust as it came out of a milling machine.

*A special message
for insecticide formulators . . .*



VELSICOL

THE GROWING IMPORTANCE OF ENDRIN IN PLANT PEST CONTROL

ENDRIN ANSWERS MANY NEEDS—Velsicol Endrin fills the need for an insecticide of relatively low toxicity to humans that will kill a wide variety of plant pests that are either resistant to other insecticides, or difficult to control. It is a chlorinated hydrocarbon, with lasting residual qualities. Although it has greater insecticidal activity than other chlorinated hydrocarbons, it can be used safely by individual farmers. It is also economical.

USE INCREASING—Endrin now has over forty label acceptances (see list below) covering control of many more than that number of insects. Some of these acceptances represent substantial tonnage of potential use. Among these volume uses are the control of insects infesting cotton, tobacco, apples, sugar beets, sugar cane, and cabbage and other cole crops.

COTTON INSECT CONTROL—Endrin is the one insecticide that will control both boll weevils and bollworms. Cotton farmers find that it improves quality and yield at substantial savings. Long residual action means fewer applications per season.

TOBACCO INSECT CONTROL—Endrin is effective against many tobacco insects that formerly could only be controlled by a combination of insecticides. Endrin kills horn worms, tobacco

budworms, grasshoppers, tobacco flea beetles, cutworms, loopers, and many other pests of tobacco.

RED BANDED LEAF ROLLER CONTROL ON APPLES—Endrin now has label acceptance for control of red banded leaf rollers on apples. In grower trials, it has been proven effective against even resistant leaf rollers. The same dosage will also kill plum curculios, which results in a considerable economy for the apple grower.

VELSICOL PROMOTIONS—During 1960, Velsicol Endrin will be promoted in various areas for major uses. These promotions will include advertising to farmers and dealer sales support. Details will be released as available.

ADVANTAGES OF VELSICOL ENDRIN—Velsicol Endrin is easy to formulate. The white Endrin crystals dissolve quickly, and make bright, clear emulsifiable concentrates. The fine particles mix uniformly and grind easily, to help make top quality dry formulations. Velsicol Endrin is packaged conveniently, in 100 pound fiber board containers with telescopic slip-on covers. These containers are of narrow diameter, for easy lifting and pouring, and have a polyethylene lining, which permits drums to be completely emptied without loss of material.

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VELSICOL ENDRIN

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AC-40

Please send me your new series of Endrin literature.

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We grow good peanuts in North Carolina, and I give lots of the credit to Terraclor. I got some of the best peanuts I ever made where I used it for stem rot.



Here on Long Island, we're growing healthy cabbage now that we're using Terraclor in the transplant water.

We county agents have been running a lot of stem rot tests on Georgia tomatoes, and you could tell to the row where Terraclor was left out of the transplant water.



Like most Arizona cotton farmers I'm all for Terraclor. There's nothing like it for controlling damping-off.

Terraclor has really done the job on beans for root and stem rot. It's meant improved stands and increased yields all over California.



I'm a cotton pathologist. I can tell you that down here in Texas, soil fungicides return many times the investment.





Men who know are saying...

Terraclor® SOIL FUNGICIDE

*Gives protection, bigger yields,
greater profits*

Terraclor pays off on:

COTTON: 25-30% of total disease losses are caused by seedling diseases. Replanting costs \$5-15.00 per acre, plus loss of pre-emergence herbicide previously used. Terraclor may increase yields and return the grower more than 15 times his investment through uniform stands of better grade cotton.



CABBAGE, CAULIFLOWER: Severe club root infection can take a field out of crucifer production entirely. Terraclor control has provided 3-5 ton per acre increases for a return of 10-30 times the investment. Terraclor also controls black root or wire stem.



PEANUTS: Faced with the threat of a 50-60% crop loss, growers can realize Terraclor-increased yields of as high as 350-500 lbs. per acre of clean peanuts - free from soil. This return is many times the cost of the chemical invested for control of stem and root rot (Southern blight).

BEANS: Root and stem rot losses run as high as 30-40%. Terraclor may increase yields by 200-300 lbs. per acre and return growers 10-15 times the cost of treatment. Terraclor also controls white mold.

TOMATOES, PEPPERS: Stem rot (Southern blight) can cut production 30-60%, depending on severity. Terraclor treatment can return 10-20 times the investment by increasing yields $\frac{1}{2}$ to $\frac{1}{2}$.



LETTUCE: Growers have lost 25-50% of their crop to leaf drop and bottom rot. Terraclor may increase yields by $\frac{1}{2}$ for a profit far exceeding the chemical cost.

Also:

POTATOES (Scab, Rhizoctonia)

WHEAT SEED (Common Smut or Bunt)

GARLIC (White Rot)

ALFALFA, CLOVER (Crown Rot)

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Bunker Hill Phosphoric Acid Plant Nears Completion

Construction of the Bunker Hill Co.'s phosphoric acid plant at Kellogg, Idaho, is nearing completion and production is scheduled to begin in July. The plant will produce 130 tons per day of phosphoric acid.

Dorr-Oliver, Inc., New York, is handling the design engineering on the plant which is the first step of construction by Bunker Hill at the site. Additional fer-



tizer production facilities are planned for the future.

Mich. Fertilizer Use Up

Michigan farmers use three times as much fertilizer now as they did in 1950, according to Ray L. Cook, head of the Michigan State University soil science department, who spoke recently at the 45th annual Farmers' Week in East Lansing.

Soils once needed more of almost all nutrients, he said, but nowadays, nutrient balance gets plenty of attention. The good manager fertilizes in proportion to yield, Dr. Cook pointed out, that is, he said, he puts the most plant food on his best soils.

Move Atlanta Office

The Atlanta regional office of the United States Borax & Chemical Corp. has moved to larger quarters at 1627 Peachtree St., N. E. This move follows the company's recent reorganization which combined the sales forces of its

former Pacific Coast Borax and United States Potash divisions into one marketing department.

Fills Nitrogen Div. Post

Eugene L. Heintz has been appointed a sales representative for Allied Chemical Corp.'s Nitrogen Division. He is a former county extension director in Muscatine County, Iowa.

Mr. Heintz's territory is west central Illinois.

China Fertilizers Up

Some 1,330,000 tons of chemical fertilizers were produced in mainland China last year, an increase of 64.4 per cent over 1958.

Tenn. Corp. Plans Expansion

Tennessee Corp. is planning to spend about \$13,000,000 to build a new plant and to increase the capacity of two others. About \$11,000,000 will be spent on an

ammonia making plant with a capacity of around 100,000 tons per year at East Tampa, Fla. The facility is expected to be completed early in 1962.

Southern Nitrogen Co. will buy 30,000 tons a year of the plant's ammonia output and Tennessee Corp. will use the rest for the manufacture of its own Di-MoN, a source of phosphate and nitrogen fertilizers.

Israel Potash Down

Production of potash at the Dead Sea Works, Sodom, Israel, fell during 1959 approximately 30,000 tons below the figure of 135,000 tons which had been anticipated. Improved processes, however, are expected to raise production by 15 per cent during 1960 and a total of 180,000 tons annually is projected.

Panogen Sales Representative

Gerald Zirbel has been named sales representative for the Panogen Co. division of Morton Chemical Co., Chicago. His territory includes the company's north central region and his headquarters are at Detroit Lakes, Minn.

Armour Acquires Plant

Armour Agricultural Chemical Co., Atlanta, Ga., has acquired the property and buildings for a new liquid-bulk blend fertilizer plant near Centralia, Missouri. The plant site and buildings had been a pumping station of the Sinclair Pipe Line Co.

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"TAKO" — Airfloated Colloidal Natural Kaolinitic Kaolin, Fertilizer Grade, is practically a chemically pure inert natural colloid with exceptional qualities. Excels as a coating agent or conditioner of granulated or prilled high analysis fertilizers, absolutely preventing sticking or caking in production, most satisfactory in eliminating bag set. "COSTS SO LITTLE—DOES SO MUCH." Used in large tonnage year after year.

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Granular Attacay Bulletin

Carriers and diluents for granular insecticides, fungicides, and herbicides are the subject of a bulletin being offered by Minerals & Chemicals Corp. of America, Menlo Park, N. J. The brochure presents information on granular Attacay and lists chemical analyses and physical properties.

Will Catalog Supplement

The Will Corp., Rochester, N.Y., has released its latest issue of Lablog, the periodic supplement to the firm's Catalog 7.

Pyrethrum Booklet

The qualities of pyrethrum in the manufacture of insecticides are described in a booklet prepared by Charles Hurd Associates, N. Y.

Fuller Indicator Booklet

Fuller Co., Catasauqua, Pa., has prepared a bulletin that describes how material-level indicators accurately and automatically control the level of pulverized, fine, crushed, or granular materials in bins or silos. Two Fuller indicators, SG-4 and SG-4X, are compared and described in the bulletin.

Portable pH Meter

Analytical Measurements, Inc., Chatham, N. J., is offering a pH meter that is portable so that it may be used to make pH readings anywhere on a production line. The unit—model 700 Big Scale pH meter—features a single operating control and a high output electronically modulated amplifier, with printed circuitry, and sensitive meter elimination.

Richardson Y-Veyor System

A system which, in field tests, has enabled two men to bag and sew up to 16 100-pound bags per minute is being offered by Richardson Scale Co., Clifton, N. J.

Combined in the system are two packers and a Y-type arrangement of four flat-belt bag convey-

Equipment, Supplies, Bulletins

ors. A "swivel conveyor" is located at the fork of the "Y" and acts automatically to channel two bagging lines into a single sewing line.

Metalsalts Bulletin

A four-page bulletin, published by the Metalsalts Corp., Hawthorne, N. J., describes specific problems involved in the prevention of bacteria, fungi, and mildew attacks on various products and industries.

Metalsalts produces slimicides, mildewcides, preservatives, fungicides, and disinfectants. Copies of the bulletin are available from the company at 200 Wagarwon Road, Hawthorne.

Thiodan Insecticide Guide

A compact guide for users of Thiodan insecticide has been published by the Niagara Chemical Division of Food Machinery and Chemical Corp., Middleport, N. Y. The new guide features a chart on how to use Thiodan and suggested amounts and time of application for control of specific pests.

Tryco Spray Equipment

Tryco Manufacturing Co., Decatur, Ill., is making available a complete line of pre-emerge spray equipment this season. Two, four, and six row units are offered as complete sprayers or as kits to be added to existing spray equipment.

Nozzle mount brackets can be attached to each packer wheel and accurate adjustments can be made in any direction to correctly position the special nozzle.

Sturtevant Automatic Blender

An automatic rotary blender and hopper, on a movable bed, is being offered by Sturtevant Mill Co., Boston, Mass. The unit can be used to blend materials as they come from other processes and introduce them directly into the next process.

A supplemental hopper holds other ingredients to be introduced into the next process, yet keeps them from intermixing until the appointed time. The blenders are available in capacities of from 500 pounds to 20 tons.

Completely New Plant Food Line Introduced By Swift

A complete line of eight new and improved lawn and plant food products is being offered by the Vigoro Research Division of Swift & Co., Chicago. The new products are designed for ease of handling, the company points out, and the new lightweight formulas are concentrated. Each product is tailored to the requirements of the various kinds of plant materials found in the home yard. Distribution among garden stores and supermarkets now is in progress.



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**Six trace elements, in fritted form, make
FTE more productive, more predictable**

It took years of development and testing to perfect FTE—to get just the right amounts and proportions of the six elements, and the proper degree of *controlled solubility*, for best results.

While two standard formulas are available, each developed to "work best" in specific areas of the country, both can be *safely used anywhere, and on any crops...* with assurance that the nutrients needed will be supplied all season.

While FTE may cost more per pound than more soluble products, its greater effectiveness permits you to use less of it in your mix for any desired results. That's why more and more companies are using it, and in more and more of their production.

Have you tried FTE? You still have time to prove these facts for yourself this season.



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LITERATURE AVAILABLE

RESIDUAL VALUE OF PHOSPHATES by L. E. Ensminger, soil chemist, Agricultural Experiment Station, Auburn, Ala. Numerous field tests have been conducted since 1930 to determine the residual value of phosphorus in terms of crop yields. Among the findings: plant yields showed residual effects that were directly related to past phosphate fertilization; where high amounts of phosphorus had accumulated, yields were not reduced much when phosphorus was discontinued; and basic slag gave the greatest residual effect of any of the sources. Bulletin 322, Jan. 1960.

AC

HOW FERTILIZER DEALERS AFFECT FERTILIZER USE by O. E. Thompson, L. P. Danker, and D. D. Kleist, Department of Education, U. of California. The findings of a study to test new means of purveying to farmers the information derived from test plots are presented in this booklet. Almost 80 per cent of the farmers surveyed listed fertilizer fieldmen and salesmen as their source of information on fertilizer use.

AC

STORED-GRAIN INSECTS AND THEIR CONTROL in the Northeastern States by H. C. Chapman and J. B. Schmitt, New Jersey Agricultural Experiment Station, Rutgers University. A compilation of various methods of insect control, sanitation, and protection for grain storage facilities. Bulletin 791.

AC

INSECT INFESTATION as a Factor in Storing Farmers Stock Peanuts Grown in Georgia, by D. W. LaHue, B. W. Clements Jr., and Herbert Womack, Georgia Coastal Plain Experiment Station, Tifton, Ga. The results of a study to determine the species of insects infesting stored peanuts, their abundance, and the amount of damage they cause. Marketing Research Report No. 364, USDA.

AC

FOREST DISEASE & INSECT CONDITIONS in the Northeast—1958, by Paul V. Mook and W. E. Waters, Northeastern Forest Experiment Station, Upper Darby, Pa. A summary of major forest diseases and insects compiled annually as a part of the effort to reduce timber losses. Station Paper No. 120, 1959.

AC

HISTORY OF THE AFRICAN PYRETHRUM INDUSTRY by T. F. West, Reprinted from the Journal of the Royal Society of Arts, London. An informative discussion of the development of the pyrethrum industry by one of the pioneers of British pyrethrum research.

AC

USING LOW-VOLUME FARM SPRAYERS, by T. E. Corley, Agricultural Experiment Station, Auburn. An explanation of proper sprayer use, how to calibrate a sprayer, how to mix chemicals, and special uses of spray equipment. Circular 126, Jan. 1959.

AGRICULTURAL CHEMICALS

Heads International Ore

Hugh S. Ten Eyck, recently-elected president of International Ore & Fertilizer Corp., New York, joined the company 12 years ago following eight years as a metallurgist with Pyrites Co. of Wilmington, Del., and another eight years with Southern Phosphate Corp.



Elected vice president of the company at the same time that Mr. Ten Eyck was elected president, was Ronald P. Stanton, who also has been with the company for 12 years.

Strike Ends at Penick

Workers of S. B. Penick & Co., New York, returned to their jobs last month to end a five-week walkout against the company. The strikers voted to accept a new two-year contract. The strike, which began Feb. 1, affected 340 union members at Penick plants in Newark, Jersey City, Lyndhurst, and Montville, N. J.

Schelm Names Pair

Dr. Edward M. Meiner, owner of Farm Crop Soil Service, Ft. Recovery, Ohio, has been appointed distributor for nitrogen solutions and liquid mixed fertilizer equipment by Schelm Brothers Inc., Peoria, Ill.

At the same time, Schelm announced the appointment of Ben J. Titus as a sales representative for its Fertilizer Equipment Division. Mr. Titus will cover Indiana, Michigan and Kentucky.

Wursten Heads Idaho Group

Jack Wursten was elected president of the Eastern Idaho Plant Food and Chemical Association at a meeting attended by 70 dealers and distributors in Idaho Falls. Wilbur Brown was named vice president and Lyle Whiting was re-elected secretary-treasurer.

WASHINGTON REPORT

(From Page 77)

This disease, carried by mosquitoes to man, hits at a nation's most

precious natural resource—human beings.

"There must be no slacking of effort until the disease has been entirely stamped out, and the last remaining case in the remotest corner of the earth has been tracked down and cured," according to Dr. Candau.

A real medical milestone is being marked by the effort to eradicate—rather than just to control—a disease on a world-wide basis.

If the present campaign to wipe out malaria succeeds, it will make medical history.

And success depends upon the use of insecticides to kill malaria-carrying mosquitoes. Any way you look at it, the pesticide industry has a stake in celebration of World Health Day, held every April 7, and by pointing out to the public that this great medical triumph that will save millions of lives and open the door to increased living

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Each year, it has been our aim to improve our facilities, products and services. In 1959, Armour took another step forward to serve

you better with the acquisition of a modern ammonia plant at Crystal City, Missouri. Now, Armour's service to agriculture and the industry is more complete than ever.

As America's needs for more and better fertilizers continue to grow, Armour Agricultural Chemical Company will continue to improve the products and services that have made the Armour "A" a symbol of quality in the fertilizer industry . . . the "BIG A" in agriculture.

31 sales offices serving the fertilizer industry

ARMOUR AGRICULTURAL CHEMICAL COMPANY
General Offices, Atlanta, Georgia

standards the world over depends upon the proper use of insecticides.

The 25th Annual Meeting of the Chemurgic Council here produced more than a spate of talks praising progress of researchers in using chemistry to find new markets for farm crops.

Authorities, including Agriculture Secretary Ezra Taft Benson, and representatives from leading farm organizations agreed: industry is going to become a growing consumer of raw agricultural products.

On the horizon is the use of surplus corn for industrial alcohol, plants now in the weed class are being considered as sources of pulp for paper, certain industrial oils, and ingredients for the booming plastics industry.

Farm organizations, faced with farmers' ability to produce more of many products than people can consume, are looking to chemurgy as a new market for known farm products and a growing market for new plants.

While not a big factor now, it is a development fertilizer and pesticide makers will want to watch closely. For producing raw materials for industry may follow different rules from producing for the human stomach. It is obviously a field in which both fertilizers and pesticides will play a part.

A law case now before the U. S. Supreme Court may have broad enough repercussions relating to the use of adverse publicity to bear close watching.

It's the Noerr Motor Freight case. This is a suit against a group of eastern railroads charging that the railroads used destructive publicity to defame the long-haul truckers and thereby injured them.

This case has been in litigation for years. But recently, a U. S. Court of Appeals affirmed a lower court decision holding the eastern railroads liable for treble damages for harm resulting from the destructive publicity. In addition, the

railroads were enjoined from continuing this kind of program.

Now the case has been placed before the U. S. Supreme Court where the merits and demerits of the appeal will be considered within the near future. If the Supreme Court takes up the case for a ruling, a final decision may not be forthcoming for a number of months, perhaps even a year.

The question is a new one in law and whatever is decided is

likely to have far-reaching effects upon any kind of deliberate destructive publicity program which causes demonstrable harm to the victim.

To illustrate the potentiality of this case, another court action already has been filed by a farmer cooperative against a group it alleges to have used destructive publicity to defame the cooperatives and to cause them economic harm.★

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You need little or no stabilizer when formulating dusts with the newer pesticides when you use PYRAX ABB as the diluent.

The unusual combination of chemical inertness, neutral pH, dry flowability and low moisture content has made PYRAX ABB the logical choice for formulating the commonly used toxicants.

When you dilute any toxicant

with PYRAX ABB, you reduce costs due to easier handling, better coverage, and simpler formulation.

The excellent compatibility of PYRAX ABB has made it the most widely used Pyrophyllite in the agricultural field.

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Title _____

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p-9

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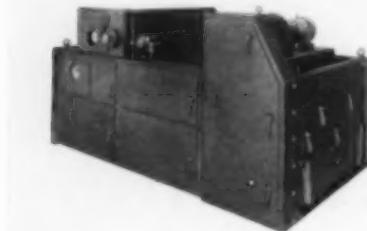
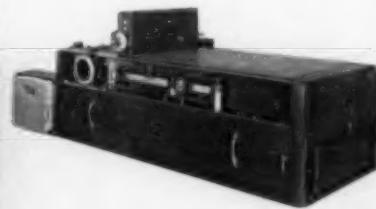
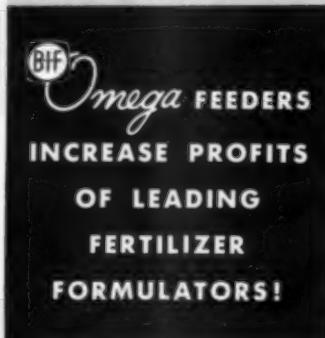


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- blending or feeding dry ingredients . . . ammonia, rock dust, solid nitrogen, potash, super, triple-super, etc.

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High Capacity — feed rates of over 3,000 lbs. per min.
High Accuracy — $\pm 1\%$ by weight of set feed rate within range
Wide Range — provided by 100:1 variable speed transmission
Bulletin — 35-N62

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Extra High Capacity — feed rates to 10,000 lbs. per min.
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Wide Range — 10:1
Bulletin — 35-20A-1

MODEL 36-20

High Capacity — 0 to 10, 100, 500, 1000, 2000, 3000 lbs. per min.
High Accuracy — $\pm 1/2\%$ of maximum rate
Wide Range — 10:1 (constant speed drive); 50:1 (variable speed drive)
Bulletin — 36-P1



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AGRICULTURAL CHEMICALS

LOUISIANA MEETING

(From Page 62)

that it is not necessary to completely kill the hardwoods but to control them so that the young pines can get above the hardwood cover. Hadley Fontenot, County Agent, described weed control in rice fields in Southwest Louisiana.

A new feature of the conference this year was a demonstration of new agricultural planes and equipment at the City Airport. Six newly-designed planes were on exhibit by their companies and were demonstrated by their pilots in take-off, landing operations, speed, climb, etc., as well as new types of equipment on the various planes. This was considered a most valuable addition to the conference and similar demonstrations are planned for the future.

Special guests attending the conference were W. A. Lewis, president, Delbert Williams, vice president, and Asa Burroughs, executive secretary of the Texas Aerial Applicators' Association, and Cy Emery, president of the Mississippi Aerial Applicators' Association.

The conference was concluded on the evening of January 22 with a cocktail hour and banquet at the Bellemont Motor Hotel, with W. A. Rose, president of the Association, as toastmaster.★

MISSISSIPPI MEETING

(From Page 61)

the aviation industry. Cost of building the plane will be about \$300,000. The first version of the plane will be flown late this summer with the full scale version expected to be ready as soon as the 250 horsepower gas turbine engine is available.

Made of fibre glass and plastics instead of metal, the plane will land and take off at 35 miles an hour and will be able to clear the ground in a 50-foot run.

The plane will have a high cruising speed, flying at 350 miles an hour at 20,000 feet. Its performance will be equivalent to a helicopter's, a feature developed at the university through a system of "high lift." It is designed with a ducted propeller (built with a shroud around it) which gives it more thrust, about twice the thrust of a conventional plane with the same horsepower. (Photo on Page

55 shows Dr. Raspet with model of plane.)

Aerial applicators are seeking to have a bill introduced into the Mississippi Legislature that would reduce sales tax on agricultural planes and plane equipment from three per cent to two per cent.

Mabry Anderson, chairman of the legislative committee, also reported that a measure already in the house of the state legislature.

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Everyone knows Barden's outstanding superiority in suspension: it's a "must" in preparing wettable powders. Barden is the industry's kaolin standard for a carrier-diluent in wettables and dusts; for an anti-caking conditioner in prilled fertilizers, and 93-94 percent sulfur.

These Barden features make it superior for all formulations: lowest abrasion...better sticking...high bulking value...greater uniformity...better deposits...maximum economy...superior wettables.

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would provide for the licensing of aerial applicators and place them under the control of the Mississippi Aeronautics Commission.

The results of a survey conducted by the state university indicated that there is a lack of properly trained pilots of agricultural aviation. About 200 agricultural pilots were employed in application services in January. More than 80 per cent of the operators of application firms said they could use more pilots, if they could get more good, qualified men.

Operators estimated they would need 13 per cent more pilots in the coming season than in past "normal" seasons.

All of the operators supported a proposed pilot-training center in the Mississippi Delta area. It was revealed that a large number of out-of-state pilots are employed as agricultural pilots in Mississippi.

The conference adopted recommendations to establish an agricultural pilot-training school at Sunflower Junior College, Moorhead. It was suggested that the present session of the Legislature be asked to appropriate money to support and maintain the school.

Other program speakers included Jay A. McCausland, Washington, D.C., Federal Aviation Agency; Frank Wignall, Jackson, Miss., supervising inspector, F.A.A., General Safety Office; Joe Werbke, F.A.A., Fort Worth, Texas; C. A. Moore, Jackson, director of the state Aeronautics Commission; L. J. Padget, Gulfport, Miss., assistant to director, U.S. Department of Agriculture, Plant Pest Control Division; A. G. Bennett, Mississippi State University, leader extension entomologist; B. F. Smith, Stoneville, Miss., executive vice president of the Delta Council.★

WEED MEETING

(From Page 91)

the individual surfactant, and (5) the surfactant concentration. In the aqueous systems employed, the relative effectiveness of the surfac-

tant in formulations has appeared not to be correlated with the chemical class or subclass to which it belongs, i.e., anionic, cationic, non-ionic, or ampholytic types. The anionic lignin sulfonates, employed as dispersants, and an acrylic polymer thickening agent have shown essentially no enhancement of herbicidal effectiveness, and some have significantly decreased the initial levels of herbicidal activity."

In another paper, a new herbicide developed by Dow Chemical Co., (0,2,4-dichlorophenyl 0-methyl isopropylphosphoramidothioate) was described as giving excellent control of crabgrass in lawns. In addition, it is said to show promise for the control of grassy weeds in rice, and weeds in young citrus plantings.

Discussing weed control from the viewpoint of the farm organization, Warren E. Collins, economist with the American Farm Bureau Federation, said that effec-

tive, low cost weed control is one of the farmer's most promising tools in his attempt to increase production and lower costs. It is estimated, he reported, that weeds cost U. S. farmers four billion dollars each year, which is equal to about one-third of the 1959 net agricultural income. He called for a program which would include:

1. Immediate elimination of existing confusion with respect to the use of chemicals in weed control, and the adoption of a policy by government authorities to insure the exercise of caution and sound judgment in future public releases regarding farm chemicals.

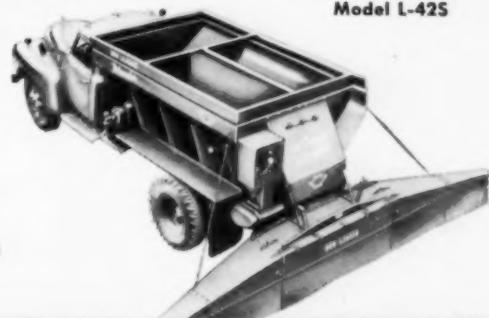
2. Expanded research in chemical weed control.

3. Strengthening and standardization of state seed and weed control laws.

4. More effective farmer educational programs regarding weeds and seed by the Extension Service and farm organizations to overcome problems arising from farm-

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Mail coupon for L-425 literature and a copy of "Your Land Is Different" a booklet designed to help you sell more bulk fertilizer.





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INSECTICIDE GRADE
PYROPHYLLITE

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★ **Chemically inert**—Insecticide Grade Pyrophyllite (aluminum silicate) has a pH range between 6 and 7. Because it is non-alkaline and chemically inert, it is thoroughly compatible with all leading pesticide chemicals. Will not react with them and lower their effectiveness.

★ **Non-Hygroscopic**—Dusts compounded with Glendon's Insecticide Grade Pyrophyllite will not absorb moisture. Thus there is no tendency for the finished formulation to cake even following long storage.

★ **Uniform**—Ground in a continuous mill and then treated in an air separator to remove oversize particles, 92 to 95% of the resulting product will pass a 325 mesh screen. Average particle size is below 5 microns. Weight, 32 lbs. per cu. ft. Because of its favorable physical characteristics and uniformity it forms homogeneous mixtures with pesticides and will not, like some other diluents, settle out from the active ingredients upon standing.

★ **Superior Adhering Properties**—Because it is difficult to wet, Glendon's Insecticide Grade Pyrophyllite clings firmly to plant leaves even through heavy rains.

★ **Superior for Aerial Application**—When used as a carrier in dusts for aerial application, Glendon's Insecticide Grade Pyrophyllite has been demonstrated to settle more quickly than other diluents, thus minimizing the hazards of drift, waste of toxicant and failure to hit target areas.

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er exchange of home-grown uninspected seed, hay, and grain, and apathy in weed control and prevention practices.

5. Stricter control of weeds on public lands and on highway, railroad, and utility rights-of-way.

The difficulties encountered in selling the idea of weed control to farmers were outlined in a talk by Eugene Heikes, extension weed specialist, Montana State College, Bozeman, Mont. He emphasized that much education and persuasion are necessary before the average farmer will accept the value of weed control, or as a matter of fact the merit of any new farm practice. The speaker recalled that farmers have long been noted for being an independent group, they don't like to be told what to do, and are slow to change their accepted mode of operations.

A Montana study showed that, for a chemical and labor cost of approximately \$1.25 an acre spent on weed control, the average farmer could expect a profit of about \$5.75 an acre. Yet, he indicated, surveys show that less than 60% of the wheat grown in Montana is sprayed for annual weed control. When talking to farmers, he recommends a discussion of the cost of "not controlling" weeds, adding that the surest and quickest way to persuade a farmer to adopt an approved new practice is to prove to him that it will make him money. He emphasized the importance of repeated advertising and publicity. "We must publicize and advertise our ideas much more intensively than we do. Simply a few bulletins or an occasional article in a farm paper or a radio program is not enough . . . We are living in an age when most things are sold by intensive advertising."★

LIQUID FERTILIZERS

(From Page 57)

tory when made of the proper materials.

One point should be emphasized. All tractor mounted equip-

ment for non-custom application should be designed so that with a minimum of work it can be converted for the application of herbicides, fungicides, and insecticides. It should be mounted so as not to interfere with the usual planting and cultivation equipment used on the tractor. By doing this, the farmer is able to spread his investment over a large area of utilization.

Finally, it may be said that the use of liquid fertilizers does not present any extremely difficult equipment problems, and does promise an agronomically sound, accurate, and labor saving means of fertilizer application.★★

Note: The author wishes to thank Mr. Newton Crouch of Griffin, Georgia for supplying materials and equipment for testing purposes and for the use of specialized shop equipment for the construction of experimental machines.

FARM PROGRESS SHOW

(From Page 42)

Farmer's editorial historian thinks maybe it had a sort of spontaneous birth long ago in one of those frequent jam sessions of the editorial staff in the magazine's conference room in Chicago. How it has grown from there is eloquently attested by the attendance figures: 75,000, as previously stated, for the first show in 1953; then, in successive years, 85,000, 100,000, 115,00, 208,000, 215,000 and 225,000, with over 300,000 in prospect for the 1960 show near Joliet.

The entire Farm Progress show, Mr. Bertsch said, is designed to give midwestern farmers and their families opportunity to see in action the newest agricultural machinery and equipment and to get full, reliable information on the latest means and methods for operating their farms more efficiently.

Also figuring in the background thinking is the raising of farm living standards to modern levels. That has been a primary purpose of *Prairie Farmer* editors, since this venerable rural publication was started almost a century and a quarter ago.

Exhibitors are enthusiastic about this Farm Progress show. The opportunity doesn't present itself often to show their wares to hundreds of thousands of farm people all motivated by one common interest, the problem of doing a better job of farming.

Absence of distracting side shows enables exhibitors to concentrate on their sales presentations and some remarkable results have been reported. One manufacturer sold 12 farm tractors in two days at Clarence, Ia., last year. Another, whose product retails for \$123.50, rang up sales of \$5,500. A sewing machine company reported sale of 22 sewing machines and 9 vacuum cleaners.

Fertilizer manufacturers at the show say nothing has ever been devised at events like this, equal in value to them of the demonstration plots where actual "proof of the pudding" can clinch their sales. Farmers who see for the first time what fertilizer can do to their crops are numerous reported to have fallen in line and to have started using much more fertilizer after these shows. That certainly spells progress for the fertilizer industry.★★

AMMONIUM SULFATE

(From Page 44)

be capitalized is in the sulfur value in sulfate of ammonia. In an increasing number of agricultural areas this sulfate content will become increasingly important as the application of highly concentrated forms of fertilizer materials is continued. This same situation holds with respect to the sulfate of normal superphosphate as against triple superphosphate. It is strange that the sulfate of ammonia suppliers have neglected so long to emphasize the fact that their product furnishes not one but two essential plant nutrients, nitrogen and sulphur. They are entitled to get a monetary return for the sulfur value. They have to pay well for it, as sulfuric acid, so why give it away free? About 24% of the

weight of ammonium sulfate is sulfur.

The potential supply of nitrogen from existing synthetic and by-product capacities exceeds demand now by at least 28 to 30 per cent, according to estimates by knowledgeable persons. If present capacity were to remain unaltered, it is believed supply would balance demand within five years. This, however, is too good to come true. Recently a number of natural gas firms have indicated an interest to enter this industry which has attracted so many petroleum companies.

Let me close with a quotation from a talk recently given by a market research specialist: "Competition is what we make it. Competition is the result of not acting first. Until someone needs a new product or service, there is nothing to compete for. If we are first to

fill the new need, we are not worried about competition. It is only when a need has been in existence for some time, and we have permitted another to step in and fill that need, that we begin to worry about competition. We have created that competition by not acting first. And this is a very easy thing to do when business is already good. When you hear a businessman say, 'I'm not looking for new business, I've got all the business I can handle', you know the answer is: 'Maybe today, but not tomorrow.' That's what they mean when they say: It wasn't raining when Noah built the Ark.'★★

Acknowledgements

I am indebted to Mr. H. H. Tucker, Sohio Chemical Co., and Mr. Kenneth Horner, U. S. Department of Commerce (BDSA) for suggestions and data used in the preparation of this paper. Also to George V. Taylor for permission to use one of the figures.

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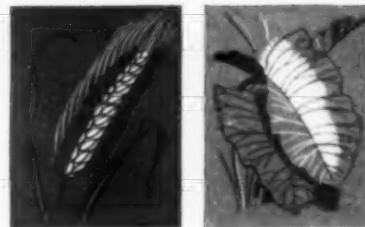
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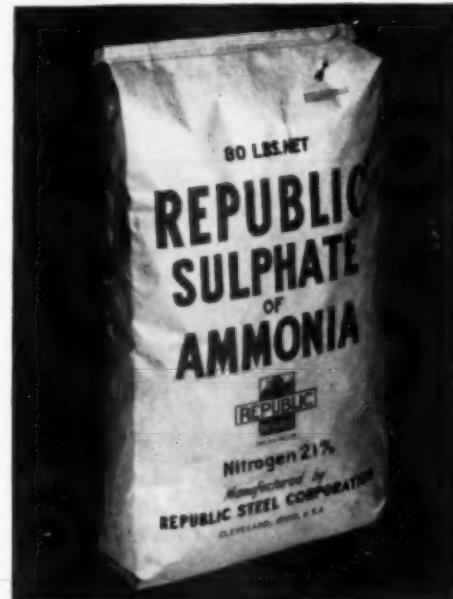
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AGRICULTURAL CHEMICALS

AROMATIC SOLVENTS

(From Page 36)

made between Panasol RX-4 (xylene-type solvent), Panasol AN-2 (heavy aromatic), and xylol when used in spray and granule applications.

Two pounds of DDT were dissolved in one gallon of solvent with emulsifier. The sprays were applied at the recommended rate of 3 qts. per acre and a heavy rate of 6 qts. per acre. The granular formulations were prepared with 2.5% and 7.5% solvent by weight and applied at 20 pounds and 40 pounds of granules per acre.

Five days after application, the plants in each plot were inspected. Panasol RX-4 (xylene-type solvent) gave ratings comparable to xylol in sprays at the recommended and heavy rates of applications. The damage ranged from none to slight. The damage caused by the heavy aromatic, Panasol AN-2, ranged from slight to severe damage at the heavy rate.

In the granule applications, Panasol RX-4 and xylol rated no damage to slight at the lower rates and damage increased considerably with the higher rate of application. The Panasol AN-2 caused damage ratings of very slight to severe at the recommended rates and very severe damage at the highest rate of application.

As a result of this field test, it was concluded that heavy aromatic naphthas are not suitable for spray or granule applications to corn. Conversely, xylene or xylene-type solvents are better suited in both applications. It should be noted that, while choice of solvent is important in granular preparations, it is equally important that the formulator produce the granules in such a manner that excessive solvent is removed.

Recommendations regarding the rates of application of insecticides to particular crops are available through the formulator, state agricultural agencies, and the U. S.

Department of Agriculture. To exceed these rates, either by accident or intentionally, may cause crop damage. Sensitive crops such as corn are very susceptible to damage if the recommended rates are exceeded. Also some solvents which do not cause damage at the normal rate may cause considerable damage at slightly higher rates. Cotton is not particularly sensitive to solvents and less damage results when applications above the usual rates are used, as seen in Table II, which shows how the damage is a function of the rate of application.

Some plants exhibit a higher degree of sensitivity to solvents than others. Because heavy aromatic naphtha would emphasize the differences in sensitivity, this type solvent was used on garden-size plots to determine the reactions on various plants. A comparison of the variations in sensitivity to solvents is illustrated in Table III with data obtained from a test run in Indiana.

Crop damage is possible when emulsions are applied under unfavorable conditions, even though the recommended rate of application is used and the solvent has been proven to be safe. If climatic conditions are adverse to a suitable evaporation rate, after the insecticide has reached the plant, burning may result. Spraying nozzles that are held too close to the plant do not permit proper atomization; therefore, concentrated droplets collect and cause burning. In a recent test on tobacco, where xylene-type solvents were used, applying the sprays too close (4 inches) to the plant caused significantly more burning than when the spray was applied at the recommended distance (12 to 15 inches from the plant). Table IV p. 115 shows damage caused by incorrect application.

The insecticide formulator is called upon to produce diverse products, such as emulsifiable concentrates, household sprays, aerosols, insecticide solutions, granules,

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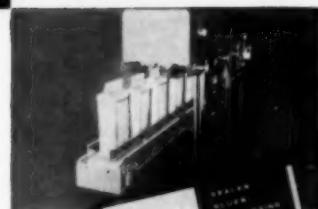
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insecticide-fertilizers, etc. Obviously there is no one "ideal" solvent which will meet all his many different requirements. Of prime importance to the formulator are the

phytotoxicity characteristics of the various solvents he must use. Refiners should be prepared to furnish sufficient test data to satisfy the formulator in this regard.★★

Table IV.

Numerical Average Phytotoxicity Ratings of Emulsifiable Concentrates Prepared with Panasol AN-2K Field Tested on Burley 21 Tobacco in Kentucky.

Insecticide	Pints/Acre	Panasol AN-2K Solvent	
		Correct Spray	Incorrect Spray
None	4	1	2
None	16	3-4	4
Endrin (1.6 lbs.) *	1*	0	0
Endrin	2*	0	0
Endrin	4	0-1	2
TDE (2.0 lbs.)	4*	0	3
TDE	8	1	3
TDE	16	2-3	4

*Recommended Rate — U. S. Dept. of Agriculture, Agricultural Handbook No. 120, 1959.

TEST METHOD: Three applications were made by a single nozzle spray held directly over the top of the plant, spraying each plant once. Forty-eight hours after the application the above ratings were taken in accordance with the following criteria.

- 0—No injury.
- 1—Slight injury (pinspotting of less than 1% of the leaf area).
- 2—Moderate injury (leaf spots covering less than 10% of the leaf area).

3—Serious injury (leaf spots coalescing—up to 50% of the leaf area burned).

4—Severe injury (leaf spots coalescing—over 50% of the leaf area burned).

In this system a rating of 1 indicates damage that probably would not be noticed by a farmer. A rating of 2 would cause farmer complaint and ratings of 3 or 4 would result in serious loss to the farmer.

phosphorus industry consisted of two small electric furnace installations, and a blast furnace which was later abandoned. In 1959 there were seven commercial phosphorus producers operating a total of 29 electric furnaces. Probably half the phosphorus furnaces built in the last 10 years are based on TVA design.

Fertilizer Production. Scientists and engineers at the fertilizer-munitions development center have developed improved fertilizers and better processes for making them. The fertilizers, some of them experimental, have been incorporated into the soil-crop research of many agricultural colleges. They have been used by farmers in three-fourths of the states, in educational programs, operated in conjunction with the colleges, designed to con-

THIS IS TVA

(From Page 33)

furnace acid. It permits the production of clear liquid fertilizers with part of the phosphate being provided by wet-process phosphoric acid.

Diammonium Phosphate. TVA's production of DAP, which contains 21 per cent nitrogen and 53 per cent P_2O_5 , is showing good results, both among farmers and fertilizer mixers and in building a market for it. Several commercial firms are now producing diammonium phosphate.

The Electric Furnace. TVA's research has made important contributions to the increase in national elemental phosphorous production in the United States. In 1933, the

vey to farmers the advantages of modern fertilizers, and the most effective way of using them.

TVA has been criticized by some members of the fertilizer industry for its fertilizer distribution program. These critics have often charged that TVA has been responsible for too large a production of fertilizer, over too long a period, to justify distribution on an "educational" basis.

About two years ago a committee of agronomists, agricultural economists, fertilizer manufacturers and distributors in reporting on TVA's Fertilizer Distributor Demonstration Program declared that while the program has admittedly made a major educational contribution to fertilizer use, "the amount of fertilizer distributed under the demonstration program has exceeded that which can be justified solely on the basis of education." They also concluded that "factors other than the stated educational objectives have played a determining role in establishing the tonnage of materials distributed," and that a few flagrant violations of required procedures have shaken confidence in the program in some localities and have resulted in justified criticism.

TVA replied at the time that "production at an exact level to meet educational requirements fully, but no more, is an extremely difficult task." Nevertheless they expressed a willingness to reexamine the situation periodically to assure that production levels and requirements of the educational program would be kept consistent. In the light of the above, it is perhaps significant that production of fertilizers in the demonstration-scale plants, and distribution of these fertilizers dropped to 219,400 tons during 1959, almost ten per cent under the 1958 total of 240,000 tons which was itself ten per cent below 1957 output. Distribution of the test fertilizers dropped to 236,000 tons in 1959, which was 6,800 tons under the '58 total and approximately 31,000 tons under the '57 figure.★★

NEWS BRIEFS

GEIGY AGRICULTURAL CHEMICALS, division of Geigy Chemical Corp., Ardsley, N.Y., has appointed Donald M. Mohr to its sales staff. He will represent Geigy in New Jersey.

AC

FLORIDA FERTILIZER CO. plans to start work immediately on a fertilizer plant to be built at Wauchula, Fla.

AC

S. J. SPITZ JR. has been named executive vice president of Newport Industries Co., a division of Heyden Newport Chemical Corp., New York. He joined the company in 1946.

AC

REGINALD H. PAINTER, Kansas State University professor of entomology, received the 1959 Gamma Sigma Delta national award for distinguished service to agriculture. The national honor society

of agriculture cited Mr. Painter as an outstanding teacher, leader, researcher and an authority on insect control through host plant resistance.

AC

THE SIMONSEN MFG. CO., Quimby, Iowa, has named Kay Stevenson to head its regional sales office in Le Sueur, Minn.

AC

ROBERT J. BARRUS has been appointed advertising manager for the Jefferson Chemical Co., Houston, Texas. He had been with Union Carbide Plastics Co., Division of Union Carbide Corp.

AC

NIAGARA CHEMICAL DIVISION, Food Machinery & Chemical Corp., Middleport, N.Y., has announced two appointments in its Research and Development Department. Dr. N. E. Krog has been named assistant to the director of the department while Dr. K. P. Dorschner assumes the post of supervisor, biological laboratories.

AC

CHARLES G. WARD, northeastern division sales manager for the American Agricultural Chemical Co., New York, until his retirement in 1952, died Dec. 31 at his home in Hingham, Mass.

AC

O.K. FERTILIZER CO. has been founded in Guymon, Okla. The incorporators are: Worth Jeffus, William Lane Garrison, and Winifred Jeffus, all of Guymon.

AC

HOWARD COWDEN, president of the Consumers Cooperative Association, Kansas City, Mo., has been named president of the Farmers Chemical Co. of Joplin, Mo. CCA recently purchased a majority interest in MFA.

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HOWARD U. CUNNINGHAM, until 1957 managing director of Scottish Agricultural Industries Ltd. and a former president of the Fertilizer Manufacturers' Assn. (England), was accidentally killed Feb. 4 near his home at West Linton, England when he was thrown from a horse. He was 63.

COTTON MEETING

(From Page 52)

the weeds while quite small and susceptible to the herbicide."

He listed the following points to take into consideration when using a layby herbicide: (1) apply after cotton is 12 inches high; (2) provide uniform bed profile, free of clods, with gradual slope to center; (3) have field free of all grass and weeds at time of application; (4) select suitable rate of material; (5) take necessary steps to secure correct rate of application; (6) make slurry of herbicide before adding to tank; (7) use 20-30 gallons of spray solution per acre; (8) make sure herbicide is in full suspension before spraying; (9) obtain complete ground coverage and minimum leaf coverage; (10) do not continue spraying while stopped or moving slowly in field; (11) irrigate within a few days after application to soak herbicide in soil; and (12) do not cultivate after application.

Appearing on the same panel, John H. Miller, U. S. Cotton Field Station, Shafter, reported that despite the research on new herbicides, "hoe-labor is still a major means of weed control in cotton." Monuron and diuron, he indicated, have proved effective for control of annual weeds after layby, but some problems still need to be solved in connection with their use.

Discussing use of defoliants on cotton, A. J. Bell, agronomist with the J. G. Boswell Co., Corcoran, Calif., again emphasized the importance of judgment and accurate timing. It must be kept in mind, he warned, "that quality as well as yield can be affected adversely if a defoliant is applied before the bolls have had enough time to

mature." Cotton growers, he counseled, should determine precisely the optimum time to defoliate,—keeping in mind that they want to minimize the possibility of harming the quality of the fiber by too early defoliation, yet still facilitating harvesting before adverse weather conditions develop in their area.★

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TEXAS MEETING

(From Page 59)

A. G. Caldwell, associate professor of agronomy, Texas A. and M., spoke on the subject of foliar nutrition. He said that the usefulness of foliar fertilization depends on a number of considerations. The plant must be able to absorb the material in amounts sufficient to supply its needs without harm. Foliar fertilization, in order to be accepted, must be effective and economical in comparison with soil application. Usually, he continued, trace elements are required in such small quantities that the cost of the material is not a major problem and, in some instances, soil applications are much less effective.

Under special conditions Mr. Caldwell said, foliar application may save a crop because of its fast action. Disadvantages, however, listed by Mr. Caldwell include: lack of compatibility of some fertilizer materials with some pesticidal sprays, risk of burning the crop, requirements of repeated applications when substantial amounts are needed, and the short term effect of foliar applications which usually are effective for only one month to one year.

The agricultural aviation research program at Texas A. and M. was discussed by Joseph C. Brusse, Texas Engineering Experiment Station, who listed three categories of study being considered by the college. He said the development of better application equipment and techniques, statistical surveys, and pilot training are desirable fields for study. For the past year and a half, Mr. Brusse pointed out, the school has been concentrating its attention on the construction of a wind tunnel, which now is near completion.

Clarence Cottam, director of the Welder Wildlife Foundation, Sinton, Texas, said that the current approach to the pesticide problem needs a new look. Instead of seeking ever-more toxic, broad spectrum compounds, he said, research people should strive to develop materials which are selective. He said they should use less rather than more toxicants. Dr. Cottam declared that through better and specific cultural practices, we should give far more consideration to effective biological control measures.

Without doubt, Dr. Cottam continued, there are times and circumstances when Federal participation is needed in insect control programs but he said that this should be kept to a minimum and not handled as a public dole. When control becomes extreme, he concluded, the cure may be more damaging than the depredation or annoyance of the insect.

The aerial application of herbicides represents a field of increasing importance in agricultural aviation as new techniques and materials are developed, according to Robert A. Darrow, department of range and forestry, Texas A. and M. In the short decade since aerial spraying with 2,4,5-T was found to be effective in the control of mesquite, he said, many new uses for the airplane and helicopter have been found in the control of brush and weeds.

In addition, he continued, advancements in plane design and distribution systems, and the flagging of timbered areas, have led to a greater adaptability of the airplane as a tool in noxious plant control operations.★

LISTENING POST

(From Page 75)

help to reduce the amount of disease.

Seed Treatment Studied

According to C. A. Thomas (4), of the United States Depart-

ment of Agriculture, Agricultural Research Service, safflower, *Carthamus tinctorius*, is a relatively new oilseed crop suited to small-grain areas in the western states. Plantings on surface-irrigated land usually are severely attacked by rust, *Puccinia carthami*. Since primary infection develops from teliospores of the rust carried on the surface of safflower seed, elimination of this source of infection would appear to be the best means of controlling the disease. Thomas studied the effects of duration and temperature of storage of seed treated with volatile mercury compounds on resulting control of seed-borne rust, and the efficacy of certain other seed protectant fungicides and antibiotics as compared with that of the mercurials. In the storage experiments with the volatile mercury compounds, the percentage of infected seedlings from treated seed decreased with increased dosage, increased temperature, and increased length of storage. Perfect control resulted after two months' storage, although under the same conditions untreated seed produced 100 per cent infected seedlings. In the comparison tests none of the other seed protectants and antibiotics tried proved to be better than the volatile mercury compounds at comparable dosages.★

Literature Cited

- (1) Gill, D. L. 1959. Effects of soaking Easter lily bulbs in Puratized Agricultural Spray or demeton, or in combined soaks, on aphids, black scale and yields. *Plant Disease Repr.* 43: 1274-1276.
- (2) Gill, D. L. 1959. Reducing amaryllis leaf spot by spraying. *Plant Disease Repr.* 43: 1272-1273.
- (3) Kastzes, J. G., W. R. Jenkins, and R. A. Davis. 1959. Control of root-knot nematodes on vegetables on the Eastern Shore of Maryland with 1,2-dibromo-3-chloropropane-fertilizer mixtures. *Plant Disease Repr.* 43: 1231-1235.
- (4) Thomas, C. A. 1959. Effect of storage time and temperature on control of seed-borne safflower rust by volatile mercury fungicides and the efficacy of certain seed protectants and antibiotics. *Plant Disease Repr.* 43: 1250-1252.

CLASSIFIED ADVERTISING

Address all classified replies to Box Number, c/o Agricultural Chemicals, P. O. Box 31, Caldwell, N. J.
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MAY 1960 GRADUATE—B. S. Agronomy, minor in entomology and plant pathology. Previous employment in research department; factory of agricultural equipment manufacturer; soil testing laboratory, others. Home in Illinois, will relocate. Box 276, c/o Agricultural Chemicals.

PEST ROUNDUP

(From Page 65)

weevil was responsible for causing complete kill of 5 to 6-year-old ponderosa pine seedlings on a ranch near Georgetown, El Dorado County.

Wet weather hampered efforts to apply control to southern pine beetle infested trees in Hardin and

Help Wanted:

Chemist—experienced in formulations and quality control of Insecticides, Fungicides and Herbicides. Well established manufacturer located and operating in the Middle Atlantic area has need for two chemists in its current expansion program. Send letter stating training, experience and salary expected to Box 277.

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1-Sprout Waldron unused 335 cu. ft. ribbon mixer, 50 cu. ft. ribbon mixer. UNUSED #9 Sturtevant rotary blender, 150 cu. ft. T304 st.st. dry material handling system including: 1800 cu. ft. weigh hoppers; AJAX "Lo-veyor" shaker conveyors; bucket elevators; screw conveyors; all st.st. Send for details.

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Liberty Counties, Texas. Controls were applied to two small spots, but 31 spot infestations were not treated. Five of these spots contained more than 100 brood trees and the large infestations were increasing. Black turpentine beetle activity increased markedly during January in Florida after high water receded.★

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FERTILIZER SUPPLIES

(From Page 49)

Potash Supplies Steady

Deliveries during the first six months of the fertilizer year indicate that net domestic potash supplies in 1959-60 will total 2,253,000 tons of K₂O (table 3), about the same level as last year.

Graduated price discounts were in effect during the first six months, changing bi-monthly for potassium chloride and quarterly for potassium sulfate. In each month just prior to the bi-monthly discount reduction (increase in price), deliveries of muriate were about twice the movement in the previous month. Total domestic deliveries, however, in the first six months were at an annual rate about 38,000 tons of K₂O below 1958-59. Potassium sulfate deliveries were at a rate about 7,000 tons above last year.

Potash imports have been greater than in the corresponding period a year ago and exports are expected to be 60,000 tons of K₂O. No new production came in during 1958-59 nor is any expected during 1959-60. Deliveries of potash from Canada during the current fertilizer year are not likely, because of production difficulties.★



ANOTHER FAMOUS

40&8



THE NEW KLM DC-8 JET CARGO SERVICE. The original "40&8" was a French boxcar during World War I. The boys in the A.E.F. knew it as their Pullman to the front. After that ride, it was all on foot, through the mud to the trenches. The "40&8" took its name from the load capacity stencilled on its side . . . 40 Hommes & 8 Chevaux . . . 40 Men & 8 Horses. It was and is the most famous boxcar in history. But now, KLM whose own history dates from World War I, introduces another "40&8," destined to be just as famous in its own right. On its 40th Anniversary, KLM introduces its new DC-8 Jet Cargo Service, soon ready to carry your products to the selling fronts the world over. It will deliver your shipments in a few hours or overnight to any market on the globe. It will reduce your inventory and handling costs, open up vast marketing areas to increase your profits. For more information on the new KLM "40&8," contact your freight forwarder, cargo agent or KLM, 609 Fifth Avenue, New York 17, N. Y. — PLaza 9-2400.



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TALE ENDS



THE exodus of population and industry to the suburbs has been joined by the Entomological Society of America, which moved from its Washington, D. C. offices to a building in College Park, Md.

The new home of ESA (pictured at left) is at 4600 Calver Road, College Park. It was purchased by the Association in 1959.

In the baseball world it's the "hot stove" league. In the insecticide business the "between-season" activity is the time honored game of "musical chairs." With the perennial departmental reorganizations, and the inevitable dissatisfaction of some of the top brass with the percentage of the market their outfits had last season, some of their top sales personnel march around thru the winter months, and then sit down in some new chairs to begin the new season. The same old faces,—but in new places. And there are always those left over, because the time honored routine in this game is that each time around there's one less chair.

AC

The Monopolies Commission in Great Britain, which has just completed a four year study of the British fertilizer industry, has indicated that in its judgment the existence of a monopoly in the industry has not operated against the public interest,—rather the reverse. The Commission's only complaint was that one producer has been making too high a profit rate.

AC

Buried in the list of chemical price changes this past month was the notice of an advance of \$2 per ton in the quotation on chlorine. This comes under the category of "man bites dog." It has been a mighty long time since anyone in the chemical business even thought of getting more money for chlorine, — which like most big-volume, chemical by-products is always running out of the producers' ears. This higher quote on chlorine augurs well, we would say, for a little more firmness in price levels this season on the chlorinated hydrocarbon pesticides. And if we get a warm, moist June in the cotton belt, maybe people in the pesticide business will have their first big money making year since —was it '51?

AC

The little league baseball park in Oakland, N. J.—a field carved out of the side of a sand hill—is named "Potash Field."

AC

DuPont fundamental research has just come up with a big discovery that could eventually revolutionize the fertilizer industry. They have brought the artificial fixation of nitrogen by enzymes commercially a step closer by isolating the enzymes themselves. This was accomplished by breaking open bacteria cells and extracting the enzymes under precisely controlled conditions. Then by the addition of pyruvic acid they were stimulated to make them carry out the fixation process outside the cell body. If the process can be made commercially practical on a large scale, it would obviously revolutionize the whole fertilizer concept.

AC

Home owners who hesitate to use salt to melt ice and snow from walks and drives because of the harmful residues, should try fertilizers, suggests Ray A. Keen, a Kansas State University scientist.

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(Discussing promising new insecticide compounds at Hercules' Agricultural Chemicals Laboratory are: George Buntin, discoverer of toxaphene; Dr. E. N. Woodbury, laboratory super-

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now available. Many of the people doing this work were engaged in the original development of toxaphene. Besides laboratory research, Hercules has placed great emphasis upon field testing and large-scale demonstrations. From such applied research in cotton insect control, for example, has come information to help farmers get better yields while lowering their production costs.

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